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Labour Market Policy and Poverty: Exploring the Macro-Micro Linkages of Minimum Wages and Wage Subsidies

Karl Pauw

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Abstract

As a middle-income country, South Africa's high poverty rate remains a serious concern and has been at the centre of policy debates for over a decade now. Since poverty is inextricably linked to the labour market, labour market policies often top the list of proposed interventions. While several types of labour market policies are arguably appropriate, this analysis is particularly concerned with two 'wage-based' labour market policy options, namely minimum wages and wage subsidies. The poverty-reducing potential of these policy options are unclear, and depend on a wide range of factors including, but not limited to, the wage elasticity of labour demand, the targeting of the policy, and the way in which wage or employment gains and losses are distributed among individuals and households under each of these policies. The complexity of the issue warrants the use of a suite of ex ante models that capture economy-wide direct and indirect effects as well as the micro-level poverty and distributional effects in a satisfactory manner. In this study, general equilibrium, micro-incidence and micro-simulation models for South Africa are developed and linked in a consistent, sequential manner to form a comprehensive macro-micro modelling framework that allows for such detailed explorations.

This study adds value to the South African literature on labour market policy evaluation and their poverty impacts in general, and minimum wages and wage subsidies in particular, both in terms of the theoretical and descriptive analyses provided. Various possible modelling approaches are explored, with careful consideration of the advantages and limitations of each. A rich set of model results is also generated. Under both the policies evaluated, the poverty outcome is shown to generally be positive but small. Furthermore, the outcome is highly sensitive to the wage elasticity of demand: while minimum wages tend to be more effective in reducing poverty when the wage elasticity is low, wage subsidies generate superior outcomes under a high wage elasticity scenario.

However, there are at least three other factors to consider as well. Firstly, both policies have important implications for consumer prices and household incomes, which from a welfare perspective cannot be ignored. Secondly, assumptions about how gains and losses are distributed in the micro-modelling frameworks greatly influence results. Thirdly, various external factors, such as 'efficiency wage effects' under a minimum wage policy or alternative financing options for a wage subsidy programme, are important considerations. The policy analyses provided in this study contribute to the debates around these and other policy questions, and ultimately facilitate the process of designing appropriate policies.

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Chapter 1. Introduction

South Africa is officially classified by the World Bank as an upper middle-income country. Certainly, as measured by its per capita income, the average South African citizen is well-off compared to international standards for developing countries, and especially those in Sub-Saharan Africa.¹ However, the economy is also characterised by extreme degrees of inequality in the distribution of income, assets and opportunities. Past discriminatory policies have left a large proportion of the population outside the economic mainstream and poor, especially when compared to an elite minority. Since 1994, one of the democratically elected government's key policy goals has been to address these economic and socio-economic disparities.

Depending on the choice of the poverty line and the data used, estimates for South Africa suggest that between 45 and 55 per cent of the population are poor (see for example Hoogeveen and Özler, 2004, May, 1998, Taylor, 2002, Van der Berg et al., 2005, Woolard and Leibbrandt, 2001). Of these poor, about half are said to be in extreme or abject poverty. These poverty rates remain unacceptably high and stubbornly so; evidence suggests that poverty rates have generally stayed the same or even increased marginally between 1995 and 2000. It is only since 2000 that poverty rates appear to have declined, thanks in part to moderate economic growth and a strong employment performance (Van der Berg et al., 2005). Although it is too early to tell, the recent slowdown of the world economy and the potential adverse effects this may have on domestic growth and employment may once again bring an end to the period of declining poverty, unless appropriate policy interventions are adopted.

Rapid real increases in welfare transfer payments to poor households between 2001 and 2006 have also played an important role in reducing poverty (Van der Berg et al., 2005). However, this has meant an increased reliance on welfare transfers as a source of income among the poor in particular.² Estimates suggest that up to one-quarter of households in South Africa

¹ The most recent *Human Development Report 2007/2008* estimates South Africa's per capita income at around US \$11 000 (2005 prices) when converted at purchasing power parity rates (UNDP, 2007).

² Most types of welfare transfer payments are means-tested in South Africa and hence explicitly target low-income individuals and households.

relies on welfare grants for part or all of their income. These grant recipient households are home to about 30 per cent of the population (Pauw and Mncube, 2007). When bearing in mind that the share of registered (individual) taxpayers is probably only about half that, it is clear why many feel the current situation is financially untenable.³ In light of evidence now emerging suggesting that much of the increased welfare spending between 2001 and 2006 was made possible by a better than expected revenue performance, former Minister of Finance, Trevor Manuel, recently stated that “*the poor could not be taken care of on the basis of tax overruns*” (see Daniels, 2006).

Given the political transition in South Africa, the immediate future of traditional welfare mechanisms as a tool for fighting poverty is somewhat uncertain.⁴ Officially, though, the African National Congress (ANC) government, in power since 1994, has long held the view that able-bodied adults should “*enjoy the opportunity, the dignity and the rewards of work*” rather than rely on welfare assistance (Matisonn and Seekings, 2001). Until fairly recently the policy rhetoric has indicated a stronger focus in the future on what could be considered ‘more sustainable’ approaches to relieving poverty, with labour market-based policies coming to the fore as a favoured alternative to expanded social security programmes. A confirmation of this came from former President Thabo Mbeki in his last *State of the Nation Address*, where he spoke of the “*elaboration of an integrated and comprehensive anti-poverty strategy*”. Key interventions of this initiative of The Presidency include (among other things) expanding the public works programme, using employment subsidies for direct job-creation for targeted groups, enhancing employment search capability, and improving on education and training initiatives (Mbeki, 2008).⁵

It is within this context that investigations into the poverty effects of labour market policies are particularly relevant in South Africa. Such analyses require an understanding of the poverty milieu and its relation to the labour market. It also requires an understanding of the functioning and features of the labour market itself. There is a vast South African literature on the extent, trends and nature of poverty in this country, some of which is drawn on in Chapter 2 and the Appendix. What is very evident from this body of knowledge and the survey data analysed in Chapter 2 is that poverty is inextricably linked to the labour market.

³ The South African Revenue Services (SARS) reports that there approximately 7 million registered taxpayers in South Africa in 2007/8 (see www.sars.gov.za), while Statistics South Africa estimates the population at about 48.7 million (2008 mid-year population estimates; see www.statssa.gov.za). This implies that only about 14.3 per cent of South Africans pay personal income taxes.

⁴ Elections were held in April 2009 and saw the election of Jacob Zuma as a more populist and seemingly leftist president than his predecessor, Thabo Mbeki.

⁵ Thabo Mbeki also made reference to ‘specific interventions in poor households’ (presumably with reference to welfare transfers, which some interpreted as indications of an imminent basic income grant), as well as improving services and assets among poor communities and ensuring effectiveness of institutions supporting women and other sectors.

A key determinant of the poverty status of a household, and by extension its household members, is the ability of its members to find employment, or perhaps more importantly, to find quality employment that offers a reasonable wage. Most analysts of poverty in this country agree that labour market outcomes lie at the heart of the poverty situation. As a result, labour market policy will always be considered “*a potentially powerful tool in the battle to eradicate poverty and inequality*” (Maziya, 2001:218).

The economic justifications for favouring labour market policies over other forms of intervention such as welfare grants are obvious. Labour market policies are considered more sustainable than welfare grants since they reward people for being in employment where they can make a meaningful contribution to the economic production. Furthermore, policies that actively raise employment levels also ensure that workers are acquiring skills and experience that will enhance their employment prospects and productivity levels in the future (see Kingdon and Knight, 2000). There are also numerous positive socio-economic externalities associated with having a job that offers a decent wage as opposed to not having this privilege and having to rely on welfare transfers or remittances.

There are, however, some caveats. Firstly, labour market policies may only be effective when designed and implemented correctly. It is unlikely that a particular labour market intervention would provide a blanket solution to all kinds of unemployment or under-employment. From this perspective it is important to understand what has contributed to the high levels of unemployment observed in South Africa today, as this will be crucial in forming appropriate labour market policies. Secondly, labour market policies should also not be seen as the only or even the main instruments for eradicating poverty. Many of the poor have very weak linkages with the formal economy or cannot be gainfully inserted into the labour market in the short run. These people may still require some form of direct assistance (Taylor, 2002, Torres et al., 2000). Labour market policies may therefore be most effective as part of a suite of anti-poverty policies.

The kind of labour market policies required to address poverty may, in many respects, seem self-evident: the analysis of the labour market features in Chapter 2 will point out that more and better-paying jobs are needed. In the long run this means creating an economic environment that is conducive to growth in labour demand, particularly demand for low-skilled workers, while at the same time addressing some of the structural supply-side issues in the labour market through investments in training and education (many of these issues are highlighted in the same chapter).

In the short run, however, these policies may need to be complemented by a variety of temporary interventions, many of which fall in the realm of ‘active labour market policies’. Active labour market policies aim to increase participation in the labour market and/or lower

unemployment levels through measures that directly affect employment demand and supply in the short run.⁶ This study focuses on such short-term interventions and their ability to make inroads into poverty in the short-run.

Public investments in labour intensive industries or public works-type programmes represent one strand of active labour market policies that operate from the demand side. The South African government's flagship job creation initiative, the *Expanded Public Works Programme* (EPWP), is one such example of a direct or active labour market policy aimed at temporarily increasing the number of low-skilled jobs while simultaneously transferring skills to participants (see McCord, 2008, for a review of the EPWP). The argument is that any skills acquired would improve participants' chances of finding employment after completion of the programme. Supply-side active labour market policies may include employment services such as job search assistance or vocational training either offered through public institutions or subsidised by government.

Another type of active labour market policy is a wage subsidy. Wage subsidies are unique in that they can be designed to operate from either the supply- or the demand-side. As a supply-side policy the subsidy is offered to workers, i.e., the worker's wage is supplemented directly while the firm still pays the original wage. The aim is to boost labour supply and hence such a policy would typically be used in economies faced with labour shortages or where high reservation wages act as a deterrent to people to enter the labour market. Traditionally, however, and particularly in a developing country context where unemployment is a problem, wage subsidies operate from the demand-side whereby the wage faced by employer is subsidised by government while employees' wages remain the same. Wage subsidy programmes may also be combined with supply-side job search assistance or training programmes. Alternatively, training may be offered by the firm as part of the employment contract. Wage subsidies have been proposed for South Africa on several occasions. Most recently a youth-targeted wage subsidy was strongly endorsed by the *International Panel on Growth in South Africa* (popularly referred to as the Harvard Group) (see Levinsohn, 2008).

Although not strictly an active labour market policy, minimum wages also represent a form of policy that intervenes directly in the wage-employment relationship. Since such a policy raises average wages in the economy, which benefits some, there is also the risk of job losses. Despite these adverse effects, these policies are nevertheless justified on the grounds of fairness and equity at the workplace. Proponents of minimum wages may also argue that they reduce poverty among the working poor and their families. The potential of minimum wages

⁶ Unemployment insurance is an example of a passive labour market policy. Often, however, active and passive policies are integrated (see Smith, 2006); for example, unemployment insurance may only be available to persons who actively seek for work, attend job training seminars or are registered with local employment offices who provide job search assistance.

to reduce poverty is both a relevant and interesting theoretical question, especially given the uncertainty about the extent to which the adverse employment effects of these types of policies counter the positive income effects for those that remain employed. The popularity of minimum wages stems in part from the fact that these policies have the potential to address equity and poverty issues without requiring any major financial commitment from government. As far as this country is concerned, minimum wages were introduced between 2002 and 2006 and form part of general guidelines and conditions of employment as set out in several so-called ‘sectoral determinations’. In total, thirteen economic sectors are covered by minimum wage legislation. This mostly includes those sectors or subsectors where workers do not enjoy representation at formal wage bargaining councils.

The aim of this study is to do an in-depth analysis of the poverty and distributional impacts of minimum wages and wage subsidies. The decision to focus on minimum wages and wage subsidies in particular is not necessarily a reflection of a preference for these two particular policies over and above other labour market policy options, but rather reflects the fact that (a) both are ‘wage-based’ policies in that they use wages as the primary policy tool, and (b) despite their fundamental differences, both seemingly have merits as anti-poverty strategies for South Africa.

While the precise workings of these policies are discussed in detail in Chapter 3, it should be clear that the first major difference between wage subsidies and minimum wages is in terms of the direction of the wage change. Minimum wages address poverty among low-wage workers directly, albeit at the risk of aggravating unemployment. Wage subsidies, on the other hand, address the poverty problem indirectly by lowering unemployment. It therefore addresses a key labour market failure in the country, but it may come at a considerable cost to taxpayers.⁷ In both instances the extent of the employment effects – and ultimately the success of the policy – is dependent to a large extent on the wage elasticity of labour demand, i.e., the responsiveness of employment levels to changes in the wage. If the wage elasticity is low, minimum wages arguably have a better chance at success, while high wage elasticities are required for a wage subsidy to have significant employment and poverty effects.

A second major difference between these two wage-based policies is in terms of their ‘macroeconomic’ or economy-wide effects.⁸ The fact that wage subsidies involve a

⁷ This distinction between the two policies is important. Although the rationale of a policy intervention is usually to correct a labour market failure, minimum wages, in contrast to wage subsidies, are likely to aggravate the labour market failure of unemployment. For that reason it is often dismissed as an inappropriate policy in a labour-surplus economy. However, from a different perspective, minimum wages addresses the failure of the labour market in ensuring (a) that workers enjoy a life free of poverty, (b) that wages are equitably distributed, and (c) that basic conditions of employment are met.

⁸ The terms ‘macroeconomic effects’ and ‘economy-wide effects’ are often used interchangeably, although the latter is preferred among general equilibrium modelers as it better captures the notion of ‘direct and indirect effects’ at *both* macro and micro levels.

substantial financial contribution by government already means that the dynamics of this programme will be very different from a minimum wage policy where financing is raised ‘internally’ through factor market substitution effects at the firm level (see discussions in Chapter 3).

The aim of this study is not necessarily to compare minimum wages and wage subsidies in terms of their poverty-reducing effects and to then, on the basis of that comparison, make suggestions as to which is a better alternative. What the study does focus on is the uncertainty surrounding the poverty effects of each policy option, particularly with regards to the nature of the wage employment relationship, the linkages between labour markets and (poor) households, and the economy-wide implications of each policy. In terms of the latter, the specific interest lies in understanding the indirect demand and price effects and the role of government as financier of the chosen policy. Such an extensive analysis requires a suitable modelling framework that captures the complexities of the policy impacts in a satisfactory manner.

Analyses of labour market policy impacts are often *ex post* in nature in the sense that they use historical data on wages, employment and poverty sampled during a period in which a certain labour market intervention was introduced. By exploring the complex relationships between these and other dependent and independent variables in an econometric framework it is sometimes possible to identify any structural breaks in these relationships occurring during the period after the policy intervention. Bourguignon and Ferreira (2003:1) note that such *ex post* evaluations are essential for assessing the true impacts of current policies and programmes, but there are many instances in which policymakers would “*value the ability to simulate ex ante the effects of alternative reforms in existing policies and programmes, or indeed the introduction of entirely new ones*”. In another paper Bourguignon and Spadaro (2005:78) argue that an *ex post* approach is often “*too cumbersome, costly and time-consuming for real-time policy analysis*”.

The South African literature on poverty and labour market policies almost exclusively follows the *ex post* tradition (see for example the compilations of leading articles in Bhorat and Kanbur, 2006b, Bhorat et al., 2001, and May, 2000). The aim in this study is to develop an *ex ante* modelling framework that can be applied broadly to the analysis of the poverty effects of development policies, and specifically (in the applications in this study) to labour market policies. In contrast to *ex post* analyses that aim to test theory or hypotheses, *ex ante* analyses employ simulation models that rely on theoretical assumptions about how agents respond to changes in, say, wages, prices or subsidies to arrive at a likely set of outcomes. These outcomes or model results, also called the counterfactual data, can then be compared against ‘base data’, which represents the initial state of the economy. Model results are

therefore presented in terms of the changes in key model variables relative to their base values.

Although described as forward-looking, *ex ante* models should not be viewed as predictive tools; rather, they are policy tools that are used to evaluate the impact of specific policy shocks under specific behavioural conditions and assumptions about how agents in the economy interact and respond to economic shocks. As such, *ex ante* models are very different from *ex post* econometric analyses or forecasting models. However, *ex post* and *ex ante* modelling approaches should not be seen as competing approaches; in fact, they are to a large extent complementary, partly in the sense that econometric evidence is frequently used to define some of the behavioural relationships in *ex ante* models, and partly because they essentially entail different but equally appropriate approaches to evaluating economic problems.⁹

There are several *ex ante* modelling approaches that are appropriate for analysing the poverty effects of labour market policies. Chapter 4 reviews these modelling approaches in detail. The clear message from this review is that different modelling approaches have different strengths and weaknesses, and there is no single modelling approach that is superior in all respects. For example, a micro-focused partial equilibrium approach permits careful analysis of labour market-household linkages at the individual level, but neglects the economy-wide effects of policies. In contrast, a general equilibrium framework better captures the economy-wide effects of policies, but is less suited for poverty analyses at the micro-level. We therefore attempt to discover in this study whether the use of both these modelling approaches in an integrated or sequential framework is the appropriate way forward in evaluating the poverty implications of labour market policies in South Africa.

A consideration of the ‘traditional’ uses of partial and general equilibrium models is warranted at this point. Usually the type of policy simulated influences the choice of model. Traditionally, therefore, microeconomic policies (such as government welfare spending, labour market policies, and so on) that have income redistribution and poverty reduction as primary policy goals are evaluated in micro-models. Such models are typically calibrated with micro-survey data observed at the individual or household level.

Micro-analyses can be simple ‘accounting exercises’ in the mould of incidence analysis-type studies, or they can incorporate some form of behavioural response by individuals or households (Bourguignon and Pereira da Silva, 2003). The behavioural models are referred to

⁹ The term ‘behavioural’ is used throughout this thesis to refer to microeconomic models of consumer or firm behavior, i.e. those that define how these agents might respond to relative price or income changes. This is not a reference to ‘behavioural economics’, which is distinct field in modern economics.

as micro-simulation models.¹⁰ Depending on the topic of study, behavioural responses may include decisions about school attendance, changes in the formation of households, changes in households' savings propensities or expenditure patterns, and so on. In the context of labour market analyses, micro-simulation refers to models of labour market behaviour as studied in the occupational choice-type models of labour market participation, employment prospects, and the earnings potential of individuals. A shortcoming of these micro-simulation or micro-incidence models is that they are almost exclusively partial equilibrium models, which means any economy-wide effects of policy changes are unaccounted for.

Macroeconomic policy impacts, in turn, are traditionally evaluated in a general equilibrium modelling framework that captures the important economy-wide effects of policies, including the indirect price effects, consumption demand effects, employment effects and financing implications. General equilibrium models further permit modellers to explicitly consider responses or actions by government and countries' international trading partners. However, just as macroeconomic policies have direct and indirect economy-wide effects, there is also an increased awareness of the potentially important economy-wide impacts of microeconomic policies. Even the more elaborate micro-simulation analyses that incorporate behavioural responses are still partial equilibrium models that only account for first round effects of policies, thus ignoring any further downstream effects on the rest of the economy.

This is an important limitation, especially in instances where microeconomic policies have significant impacts on the spending capacity of beneficiaries (an argument raised by minimum wage proponents) or where large-scale financial involvement by government is required (such as in the case of wage subsidies). Where the economy-wide or macroeconomic effects of microeconomic policies can no longer be ignored, the use of general equilibrium models is therefore warranted.

Fortunately, with the growing interest in understanding the micro-level distributional implications of macroeconomic policy shocks, general equilibrium models now capture information at a much more disaggregated level than in the past. Bourguignon et al. (2002:28) argue that general equilibrium models “*probably remain today the first step of any analysis seeking to integrate distribution considerations and economic policy at both the micro and macro level*”.

However, despite this, traditional general equilibrium modelling approaches are still somewhat limited in terms of dealing with impacts at a true micro-level. Given the complexity of the model structure, factor and household income changes are still only

¹⁰ Incidence-type models are also sometimes referred to as micro-simulation models even though no behavioural responses are modelled. This study adopts the terms ‘micro-incidence’ and ‘micro-simulation’ models to distinguish between non-behavioural and behavioural approaches.

observed at the ‘representative’ factor or household group level rather than at the individual level. This means any distributional changes that might occur within representative household or factor groups is not modelled, and ultimately the poverty estimates generated in these models reflect average impacts on groups rather than specific impacts on individuals.

The challenge is to try and bring these two distinct levels of modelling closer together in what is commonly referred to as macro-micro modelling frameworks. Macro-micro modelling can consist of combining macro (e.g., general equilibrium) and micro (e.g., partial equilibrium) models sequentially or developing fully integrated macro-micro general equilibrium models. Such a combined model framework allows modellers to exploit the best features of both these modelling approaches.

Developments in macro-micro modelling are ongoing. Bourguignon and Spadaro (2005) predict that macro-micro modelling is an area that will enjoy tremendous growth in the future, thanks largely to increased data availability, continuous improvements in data quality and better integration of micro-survey and national accounts data. Furthermore, advances in software and computing capacity have pushed out the boundaries of what can feasibly be achieved in terms of solving complex macro-micro models. However, as new techniques are developed, it becomes equally important to pause and critically assess the developments. Therefore, in addition to applying some of these methods and deriving policy lessons from them, this study also hopes to point out some of the limitations and inconsistencies of these new techniques. In this regard a particular focus is on illustrating how sensitive poverty outcomes are to the way in which the macro-micro linkages are modelled.

The study is organised as follows. Chapter 2, as explained, provides a detailed analysis of the poverty-labour market nexus. The chapter draws mainly on literature, while complementing findings with figures and tables generated using various South African labour force and household survey data sets. The analysis of poverty, the labour market and its failures, and the linkages between poor households and the labour market are important from both a policy and a model development perspective.

On the basis of the analyses in Chapter 2 strong arguments can be made to support the use of minimum wages and/or wage subsidies as anti-poverty strategies in South Africa. Thus, Chapter 3 provides a detailed theoretical overview of minimum wages and wage subsidies. As an introduction to the theoretical concepts used in this chapter, we first provide a perspective on the theory of labour demand and the important role of the wage elasticity of labour demand in explaining employment responses to (policy-induced) wage changes. The chapter then continues with a discussion of these two wage-based labour market policies, focusing on issues such as the rationale for each of these policy interventions, methods and

models that have been used to analyse their respective impacts and relevant policy design issues.

Chapter 4 provides an overview of the types of *ex ante* models that can be considered appropriate for the evaluation of the poverty effects of labour market policies in particular, but also for development policies in general. This chapter provides some thoughts around the conceptualisation of a suitable model framework, and then continues with an in-depth discussion of partial and general equilibrium models. Both these modelling approaches, as explained, have limitations and advantages as far as their applicability in this type of study is concerned, and as a result, the chapter argues, there is a strong case for adopting an integrated or sequential macro-micro modelling framework. The chapter therefore also considers the options, challenges and limitations of macro-micro modelling frameworks. A description of the specific modelling frameworks developed in this study for the evaluation of the poverty impacts of minimum wages and wage subsidies is also provided.

The model results and findings from these applications are included in Chapter 5 and Chapter 6 respectively. The minimum wage simulations are based on actual minimum wages implemented in South Africa during the last few years. For the wage subsidy simulations a hypothetical wage subsidy is modelled. In designing this hypothetical simulation, careful consideration was given to recent proposals around subsidy values, overall programme budget, and the targeting of workers and/or sectors.

The aim of these analyses is two-fold. Firstly, various important and relevant policy lessons can be learned, particularly as far as the poverty-reducing effects of these policies are concerned. The simulations are primarily designed with the idea of providing insights into the policy impacts under different assumptions about the wage-employment relationship. This is useful in the context of our earlier hypothesis that minimum wages will be more effective at reducing poverty when the wage elasticity is low, and vice versa for wage subsidies. Both policies are also evaluated under short and long-run closures, which, as explained in more detail in the respective chapters, relates to the assumptions around capital accumulation and structural changes at a sector level. For the minimum wage scenarios, additional simulations assuming labour productivity gains among beneficiaries of minimum wages are also run. These simulations illustrate how many of the negative externalities associated with minimum wages can be mitigated through labour productivity enhancements. For the wage subsidy scenarios, alternative financing options are explored, which allows for some interesting policy lessons to be drawn in this regard.

A second and perhaps equally important aim of the modelling exercises is to illustrate how sensitive poverty outcomes are to the way in which the macro-micro linkages are modelled. This is both a testament to the power of *ex ante* modelling as far as its flexibility is concerned

and to the danger that exists in disseminating modelled results without clearly explaining the underlying assumptions of the simulations.

Chapter 7 draws general conclusions about the labour market-poverty nexus in South Africa, the modelling approaches followed in this study and the sensitivity of outcomes. The important policy lessons emanating from the analyses of minimum wages and wage subsidies are also highlighted in this final chapter. An Appendix that includes additional information and technical details about the models and data used is included at the back.

University of Cape Town

Chapter 2. The Poverty-Labour Market Nexus in South Africa: A Review of the Evidence

The introductory discussions in Chapter 1 highlighted the need for understanding both how labour markets function and how the poor are linked to the labour market as this will facilitate a better understanding of the potential poverty-reducing effects of labour market policies. This chapter therefore explores the poverty-labour market nexus in more depth, drawing extensively on the recent South African literature and household and labour force survey data. The chapter starts with a review of the poverty problem in South Africa and explores the linkages between poor households and the broader labour market (section 1). Section 2 evaluates the recent labour market trends, focusing specifically on the unemployment trends and the factors that have contributed to South Africa's high unemployment rate. This section also reviews the trends in wage earnings over the last decade. Section 3 considers the determinants of employment and earnings, which are important for the development and interpretation of ex ante labour market model results, while section 4 concludes the chapter.

1. Poverty Definition and Profile

1.1. What is Poverty?

Taylor (2002:15) broadly defines poverty as the “*inability of individuals, households or entire communities to command sufficient resources to satisfy a socially acceptable minimum standard of living*”. Poverty analysis, therefore, is an attempt to define this minimum standard of living or welfare level in terms of a poverty line, and to then study those households or individuals that fall below it. Most often welfare is expressed in terms of household or per capita income or expenditure as this is easily measured, but there are various non-income welfare measures that can also be used in poverty analyses. Generally, income poverty studies measure poverty using the familiar Foster-Greer-Thorbecke (FGT) class of decomposable measures (Foster et al., 1984). A technical explanation of FGT calculations and the interpretation of FGT results appear in the Appendix (see section 1.1).

While income is important in determining the poverty status of an individual or household, it is certainly not the only suitable welfare measure. Bhorat and Kanbur (2006a) argue that any exhaustive analysis of changes in well-being should account for both income and non-income measures of well-being. The literature distinguishes between two additional dimensions of poverty, namely capability poverty and asset poverty. According to Taylor (2002), capability poverty refers to a lack of access to basic services that enable people to live and function in society.¹¹ Asset poverty relates to the private ownership of income-generating assets or access to ‘social assets’ such as community infrastructure.¹²

Although these three dimensions of poverty are often interlinked, measures of capability or asset poverty are more informative in a dynamic context where welfare changes over time are concerned. Carter and May (2001) illustrate this by defining people who are both asset poor and income poor as ‘structurally poor’, arguing that their low asset bases prevent them from mitigating the impact of short-term shocks to their income flows and they are therefore likely to remain income poor in a future period. The transitory poor, in turn, are those that happen to be income poor at a given point in time, but given their access to or ownership of assets, they are more likely to escape poverty in the future.

While these dimensions of poverty are recognised, the focus in this study is exclusively on income poverty. This limited focus is necessitated by the types of models selected for subsequent analyses of the poverty implications of labour market policy (see Chapter 4). The next section briefly looks at the recent income poverty trends in South Africa, followed by a discussion of the broad characteristics of the poor in section 1.3.

1.2. Recent Poverty Trends

Poverty remains one the biggest socio-economic challenges today. There is some uncertainty and even controversy about whether poverty has increased or decreased during the last decade. The poverty trend is a side-issue in this study; instead, the real interest lies in the relationship between poverty and the labour market (see below). Nevertheless, the debates are interesting, and hence section 1.2 in the Appendix provides an overview of the recent South Africa poverty trends.

¹¹ These services may include water, electricity, free and adequate healthcare, free education, food security, and affordable housing and transport. A lack of access to employment and training opportunities could also render a person capability poor. Often a lack of access to such services relates to income poverty in the sense that the income poor lack the financial capability of paying for basic services that are not provided free of charge. Examples include transport, clothing and food costs.

¹² The lines between asset and capability poverty may sometimes be blurred; for example, access to public schooling can be thought of both in terms of the service provided (schooling) and the community infrastructure (the school building) (see for example the analysis of income and non-income welfare shifts in Bhorat et al., 2007b).

Based on the evidence presented there (see Appendix Table 1 in particular) the consensus position has to be that poverty (and particularly extreme poverty) increased between 1995 and 2000. The extent of the increase varies widely depending on the data used, the choice of poverty line and the welfare measure used. Although slow to emerge (the IES, which is the preferred dataset for poverty analyses, is only conducted every five years), early evidence suggests a turnaround in the poverty trend since 2000. For example, Van der Berg et al. (2005) use alternative data to the standard surveys from Statistics South Africa to show that poverty had dropped by 8 percentage points between 2000 and 2004. Yu's (2008) findings, based on a comparison of the IES 1995, 2000 and 2005/06, corroborate those of Van der Berg et al. (2005) in suggesting that incomes rose by 6 percent and poverty declined by 10 percentage points between 2000 and 2005/06.

As noted, a more detailed assessment is provided in the Appendix. However, what is clear from the recent South African analyses is that the initial increase in poverty between 1995 and 2000 coincided with a sharp rise in unemployment (see section 2 below). The subsequent decline in unemployment is also consistent with declining poverty between 2000 and 2005. It would therefore seem that the poverty trend is closely linked to the trend in employment. The next section explores the links between poor households and the labour market in more detail.

1.3. A Poverty Profile for South Africa

Poverty profiles are developed with the aim to characterise the poor in terms of a range of variables, including location, demography, education, gender, livelihoods and social capital (McCulloch et al., 2001). This enables policymakers to better understand the characteristics of the poor. A useful way of generalising the approach to creating poverty profiles is to group households or individuals into several income groups rather than identifying poor households on the basis of some explicit poverty line. This approach is favoured here, as it avoids debates around what an appropriate poverty line might be. Particularly, households are grouped into five groups of equal size (or quintiles) on the basis of a ranking of their per capita incomes. The basic features of these groups vis-à-vis household size, household and per capita incomes, and labour market linkages are then briefly studied to provide a 'snapshot view' of poverty.¹³ Household per capita income is calculated by dividing the total household income by the household size and attaching the same per capita income to each individual in the household, irrespective of whether that person contributes to the pool of household income or

¹³ The racial composition and spatial distribution of the poor and non-poor population is equally interesting and important in the context of past discriminatory policies that have excluded people from participating in the economy on the basis of their racial classification or where they lived. Interesting shifts are occurring; for example, there is evidence of an emergence of a black middle class since the fall of apartheid (Van der Berg et al., 2004), while the "*rapid process of urban migration... could in the future reshape the spatial nature of poverty in South Africa*" (Bhorat and Kanbur, 2006a:4). These dimensions of poverty, however, fall beyond the scope of this particular study.

not.¹⁴ A rule of thumb often applied in South African analyses is to assume that the bottom two household quintiles, representing just over half of the population (see below), are poor.

1.3.1. Household Income Distribution

Table 2.1 presents some of the basic features of the household quintiles in 2000. This table (and the subsequent analyses) draws on Statistics South Africa's Income and Expenditure Survey of 2000, which has been merged with the Labour Force Survey of September 2000 (SSA, 2002b, SSA, 2002c) (referenced as IES/LFS 2000). The IES 1995, merged with the October Household Survey of 1995 (SSA, 1997a, SSA, 1997b) (referenced as IES/OHS 1995), is also consulted at times for comparative purposes, although the comparability of these two datasets has been questioned (see Appendix, section 1.2). Although the more recent IES/LFS 2005/06 is now available, the merged IES/LFS 2000 dataset represents the latest available comprehensive source of information on household incomes/expenditures *and* labour force activities of households. Hence, given the interest in labour market and poverty linkages in this study, the IES/LFS 2000 is selected as the basis for the analyses here.

Table 2.1: Population Distribution, Household Size and Incomes across the Quintiles (2000)

	Poor		Non-poor			All
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
General						
Share of households	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%
Number of people (000's)	13,221	9,985	7,641	6,458	5,341	42,646
Share of population	31.0%	23.4%	17.9%	15.1%	12.5%	100.0%
Avg. household size	6.0	4.6	3.5	2.9	2.4	3.9
Household and per capita income						
Avg. annual household income	R 6,913	R 13,592	R 20,779	R 40,172	R 135,187	R 42,020
Avg. annual p.c. income	R 1,169	R 2,946	R 5,957	R 13,657	R 56,626	R 11,022

Source: IES/LFS 2000

As shown in Table 2.1, each household quintile contains 20 per cent of households; the first quintile contains the poorest 20 percent of households, the second quintile contains the next poorest 20 percent, and so on. The poorest quintile contains 31 per cent of the population, while a further 23.4 per cent of people live in the second. Thus, 55.7 per cent of people were poor in 2000 according to the crude definition of poverty used here.

¹⁴ The implication of such a uniform intra-household income distribution is that all members of a household are either poor or non-poor. In reality, however, the costs of poverty frequently fall disproportionately on women, children and the elderly within households (McCulloch et al., 2001); for example, a South African study on old age pensions found positive health effects in young children when pensions went to grandmothers, and no effects when the pension was paid to grandfathers (Duflo, 2003). Unfortunately very little is known about intra-household income distributions in the South African income and expenditure survey data, hence the need to settle on a second-best approach of assuming a uniform intra-household group distribution.

The average household size across all household quintiles was 3.9 in 2000, down from 4.4 members in 1995 (IES/OHS 1995). Household size declines rapidly as we move from the poor to the non-poor quintiles. Thus, although households in South Africa are generally becoming smaller, poor households are still about twice as large as non-poor ones.

Of course, since households are grouped into quintiles on the basis of their per capita incomes, larger households will almost by default be poorer. However, the table shows that the disparities between quintiles stretch beyond the distribution of per capita incomes. Total household incomes are significantly lower in the poorer quintiles, suggesting that households are not only poor because they are large; low household incomes contribute as much to poverty. Poor households therefore have to distribute a much lower total income among much larger families, thus contributing to the fact that per capita incomes in the fifth quintile are about 50 times that of the poorest quintile.

1.3.2. Poverty and the Labour Market

That poverty in South Africa is inextricably linked to whether or not people have access to jobs that offer reasonable wages is undisputable. This section explores the linkages between poor and non-poor households and the labour market in more detail. The analysis considers (a) labour market participation rates and (b) the importance of wages as an income source across the different household quintiles. Rather than discussing the evolving picture, this section merely describes a snapshot picture of the labour market-poverty nexus in 2000, based on the IES/LFS 2000 data. Labour market trends are considered in more detail in section 2.

a) Labour Market Participation and Employment

Table 2.2 first presents labour market participation statistics of working age adults between the ages of 15 and 65 across the different household income quintiles. As before, we assume that people in the bottom two household quintiles are poor. Adults of working age can either be economically inactive (non-participants) or they can join the labour force. Participants, in turn, are either employed or unemployed. The first four rows of the table shows fractions of working age adults that are employed, unemployed (under both definitions) and inactive. The associated unemployment rates are shown directly below these shares. These are obtained by dividing the share of unemployed by the sum of the shares of unemployed and employed persons.

Table 2.2: Labour Market Participation and Wage Earnings across the Quintiles (2000)

	Poor		Non-poor			All
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Labour market participation						
Employed	21.4%	33.7%	46.7%	59.0%	72.5%	43.1%
Unemployed (strict)	20.6%	19.1%	16.3%	11.2%	4.0%	15.3%
Additional unemployed (expanded)	15.5%	10.8%	8.5%	5.2%	1.7%	9.3%
Non-participants (expanded)	42.5%	36.5%	28.5%	24.6%	21.9%	32.4%
<i>Total</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>
Unemployment rates						
Strict unemployment rate	49.1%	36.1%	25.9%	15.9%	5.2%	26.2%
Expanded unemployment rate	62.8%	47.0%	34.7%	21.8%	7.2%	36.3%
Wages and labour market linkages						
Avg. wage of employed persons	R 4,407	R 8,594	R 13,896	R 26,066	R 80,845	R 33,180
Avg. no. employed per household	0.8	1.0	1.1	1.3	1.4	1.1
% of people in 'workerless' h-holds	30.4%	16.4%	9.5%	5.7%	5.1%	16.7%

Note: The sum of the strict and expanded shares gives the total share of broadly unemployed persons.

Source: IES/LFS 2000

The table clearly shows how the level of household welfare is positively related to the fraction of employed and negatively to the fraction of unemployed 2000. Also evident are the high shares of poor people that are non-participants. Under the official definition, almost 60 per cent of ultra poor adults and almost half of poor adults were non-participants in 2000. In sharp contrast only about one-fifth of adults in quintile five were economically inactive.

What is particularly evident is the high rate of unemployment among people living in poor households. The broad unemployment rate among poor people was 58.7 per cent in 2000 (the weighted average of 62.8 and 47 per cent), compared to only 19.8 per cent among non-poor people. In fact, over two-thirds of the broadly defined unemployed were in the bottom two quintiles in 2000.

b) Wage Earnings and Income Sharing in the Household

The suggestion from the above is that poverty is closely linked to economic inactivity, high rates of unemployment and low rates of employment. High unemployment among the poor, however, only explains part of the poverty problem. Another is the fact that many of the poor that are able to secure employment are unable to command adequate wages. In one of the earlier studies of the post-apartheid era, Borat and Leibbrandt (1996) estimate what they term a low-earnings line, defined as the wage required to enable an average household to escape poverty, considering household size and average employment rates in households. They estimate that just under half of the labour force (including broadly defined unemployed) earned less than the low-earnings line. Of these, the unemployed made up half this group and

the ‘working poor’ the other half. In a more recent study, Pollin et al. (2006:27) argue that African workers still only earn a wage that is “*modestly above a reasonable poverty line*”.

Table 2.2 shows that the average wage of workers in quintile one was R4 407 in 2000. Those in quintile two earned almost double that. While these average wages are higher than the poverty line of R3 864 proposed by Hoogeveen and Özler (2006), an important fact to remember is that these workers are also typically the only wage earners in their respective households. For example, as shown in the table, the average number of reported wage earners in households in quintiles one and two are only 0.8 and 1, respectively. The implications is that “*far more poorly paid workers than higher income earners are single-income breadwinners in their families*” (Torres et al., 2000:91). Adding to the demands on poor, low-wage workers is that the wages they earn typically have to be shared within larger households (see Table 2.1).

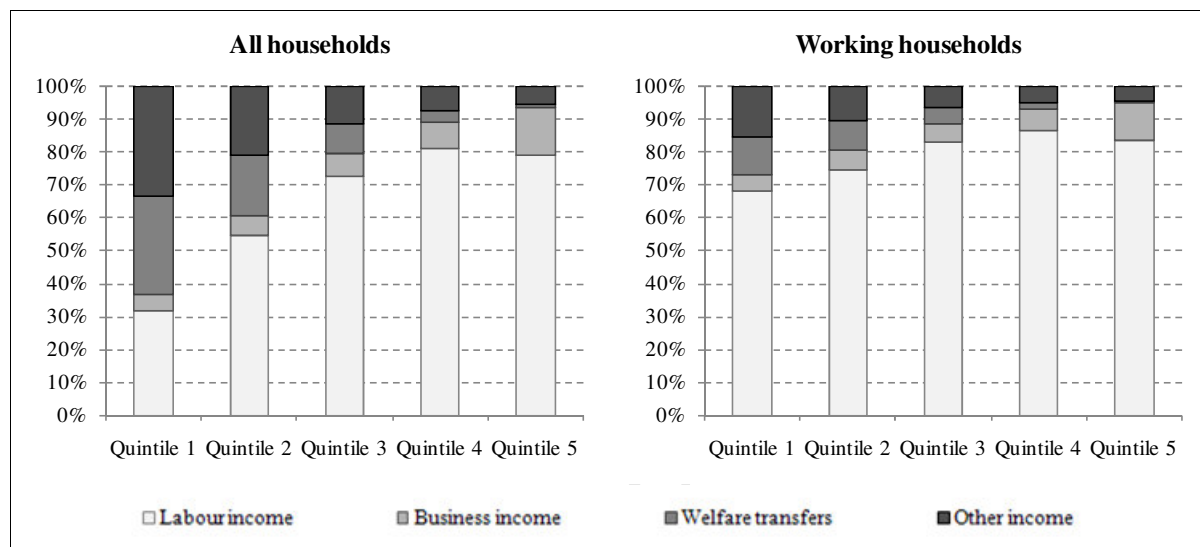
The final row of Table 2.2 shows the share of the population that lives in households with no wage-income earners. About 30.4 and 16.4 per cent of people in quintiles one and two respectively lived in households without any attachment to the labour market. The comparative figures in 1995 were 55 per cent of people in quintile one and 29 per cent of people in quintile two (IES/OHS 1995), which are slightly higher but comparable to the estimates by Klasen and Woolard (1997) based on 1993 data. The Taylor Report regarded the growing incidence of ‘workerless households’ as a major concern for the welfare system, since it creates a greater dependence on the state or social networks for survival (Taylor, 2002). However, it appears from the 2000 figures that the share of people living in workerless households has dropped considerably after 1995.

When considered in conjunction with the trend of a decline in the average number of workers per household and the decline in the overall size of households, it appears as if households are organising themselves into smaller units but with a specific intention to cluster around employed people. In a follow-up study on their earlier work, Klasen and Woolard (2005) also find evidence of a decline in the share of the unemployed living in households with no connection to the labour market. This survival strategy in the face of growing unemployment is probably linked to the fact that there is little or no social insurance for the unemployed in South Africa. It has, however, meant that even more poor people are attached to the labour market indirectly via employed household members, thus making the notion that poverty is not only a phenomenon among workerless households or the unemployed even more relevant today. It also raises the potential of reaching a relatively large share of the poor through labour market policies.

Although more people are now attached to the labour market indirectly, the links can still only be defined as weak. A simple analysis reveals that the poor rely heavily on non-wage

income sources. Figure 2.1 shows the shares of income derived from four main income sources, namely (1) income from labour, (2) income from business, (3) social welfare transfer income and (4) remittances and other income.¹⁵ The strong reliance on welfare and remittance income in the poor quintiles is evident, contributing over 60 per cent to income in the bottom quintile and 40 per cent in the second. As far as wages are concerned, the importance of this income source grows as we move to the richer household quintiles, reaching around 80 per cent in the top two quintiles.

Figure 2.1: Income Sources of All Households and 'Working' Households (2000)



Source: IES/LFS 2000

While the 'average' poor household relies very little on wage income, it is interesting to consider these same income shares within 'working households', defined here as households with at least one wage income earner. The right-hand panel of the figure shows that the wage income share in working households only ranges between 69 and 85 per cent. Thus, in those households that are attached to the labour market, wages are a very prominent income source.

From the above figure two important deductions can be made. First, since the average poor household only derives about half its income from wages, wages would have to rise significantly to have an impact on poverty. Put simply, a 1 per cent rise in wages across the board will only lead to a half a per cent increase in poor households' income. Second, despite its limited importance in poor households, wage income is still a significant income source in

¹⁵ Income from labour includes all wages and salaries earned from employment. Business income is very loosely defined as the sum of 'gross operating surplus' (income arising from the ownership of physical and/or human capital), income from dividends, and transfers from incorporated business enterprises. Welfare transfer income in the IES is made up of pensions, disability grants and family allowances. Other income may include actual or implicit income from home produced goods, gifts, donations and so on.

working households across all quintiles. A strategy of increasing wages to combat poverty may therefore significantly improve the welfare levels in working households at least. For those living in workerless households (see Table 2.2) an alternative strategy needs to be sought.

1.4. Sub-conclusions

The main focus of this section was to present a snapshot picture of the South African labour market-poverty nexus. Two central features can be highlighted. Firstly, high levels of poverty are very closely linked to high levels of unemployment and low levels of labour market participation. A reduction in unemployment is therefore likely to be effective in reducing poverty. Secondly, many low-wage workers live in large households where they are typically the only income-earners. Meagre wages are shared among many household members, suggesting that attachment to the labour market is no guarantee against poverty. Furthermore, wages represent the primary income in poor households that are attached to the labour market, which suggests that these households only have limited access to social welfare assistance. If more of the household members in these households cannot get access to employment, the only escape from poverty for them is an increase in the wages of those fortunate enough to have jobs.

The discussion raises several questions about the nature of the labour market in South Africa. It is important to understand what has caused the high rates of unemployment in South Africa, as this is relevant for understanding what kinds of policies might be appropriate for generating more employment opportunities. The large numbers of working poor also raises questions about the evolution of wages in South Africa. The following section explores these two important issues in more depth, drawing on recent South African literature.

2. The South African Labour Market

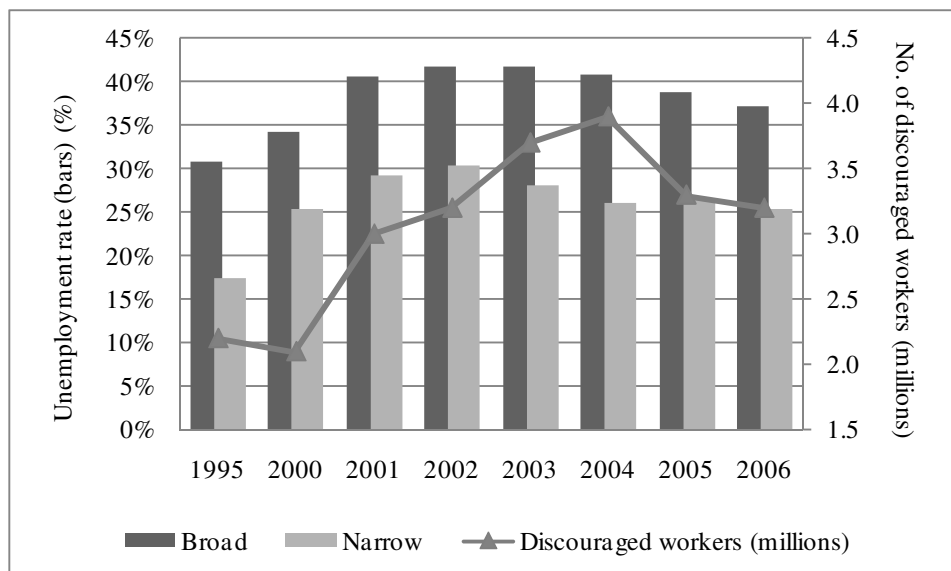
2.1. Unemployment Trends and Causes of Unemployment

One of the most troubling features of the South African labour market is the persistently high rate of unemployment. Ever since the ANC government came into power in 1994, job creation and a reduction in unemployment have been key policy goals in the fight against poverty and inequality in this country. Despite this, unemployment increased during much of the first post-apartheid decade. Figure 2.2 shows the broad and narrow unemployment rates for the period 1995 to 2005, calculated on the basis of various OHS and LFSs conducted by Statistics South Africa.¹⁶ The narrow unemployment rate increased from 17.6 per cent in

¹⁶ Statistics South Africa uses two definitions of unemployment, namely a strict (official) and broad definition. The strictly unemployed are those people within the economically active population who (a)

1995 and peaked at 30.4 per cent in 2002. Thereafter, it declined and seems to have stabilised at around 26 per cent. The broad unemployment rate increased from 30.8 per cent to 41.8 per cent between 1995 and 2002, and subsequently fell to 37.3 per cent in 2005.

Figure 2.2: Unemployment Rates, 1995 to 2006



Source: October Household Survey 1995, and Labour Force Surveys (various years) (Statistics South Africa).

Unemployment in South Africa has several defining features. The LFS 2005 data suggests that unemployment remains largely a phenomenon among previously disadvantaged African, Coloured and Asians, with only 2.2 per cent of the unemployed officially classified as White. Women make up 58.6 per cent of the unemployed despite only accounting for 48.8 per cent of labour force participants, thus signifying the relative disadvantage of female workers in securing employment. Geographically, unemployment is more pronounced in rural areas: it is estimated that about half of rural jobseekers are unable to find employment (LFS 2003), while the rural unemployed constitute 54.6 per cent of the total, despite only making up 37.5 per cent of the labour force.¹⁷

The youth labour force, defined in line with the *South African National Youth Commission Act No 19* (1996) as people under the age of 35, accounts for 55.9 per cent of the overall labour force. Yet, as shown in Table 2.3, the youth makes up 72.7 per cent of the unemployed and face a broad unemployment rate of 50.4 per cent. This stands in sharp contrast to the unemployment rate of ‘only’ 24.0 per cent among adults. The interaction between age and education is a particularly important consideration. Generally speaking, and in line with

did not work during the seven days prior to the interview, (b) want to work and are available to start work within a week of the interview, and (c) have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview. The broad or expanded unemployment definition excludes criterion (c).

¹⁷ The LFS 2003 was the last of the labour force surveys to distinguish rural and urban areas.

expectations, higher levels of education are associated with lower levels of unemployment. However, youth employment prospects are also weaker than those of adults at every level of education.

Table 2.3: Labour market participation and unemployment by age and education (2005)

	Youth		Adults		All	
Share of participants (%)	55.9		44.1		100.0	
Share of unemployed (%)	72.7		27.3		100.0	
	<i>Distribution of all youth participants (%)</i>	<i>Broad unemployment rate (%)</i>	<i>Distribution of all adult participants (%)</i>	<i>Broad unemployment rate (%)</i>	<i>Distribution of all participants (%)</i>	<i>Broad unemployment rate (%)</i>
None	3.2	45.1	11.3	28.8	6.8	33.1
Grade 0 - Grade 8	22.1	57.0	36.5	30.9	28.4	42.2
Grade 9 - Grade 11	33.0	59.0	20.1	28.6	27.3	49.2
Grade 12 (Matric)	32.7	46.7	18.0	17.7	26.2	38.0
Diploma/Certificate without Grade 12	1.0	27.0	1.0	7.0	1.0	18.1
Diploma/Certificate with Grade 12	5.6	21.2	6.9	5.0	6.2	13.2
University degree	2.4	8.7	6.2	2.3	4.1	4.4
Total	100.0	50.4	100.0	24.0	100.0	38.8

Note: Youth include people under the age of 35.

Source: LFS September 2005 (SSA, 2006).

The sources of unemployment in South Africa are multiple and complex. While some have sought to blame the education system for failing in delivering on the kinds of skills required by employers, others have pointed at sharp increases in labour market participation (especially among the youth) and the economy's inability to absorb people due to slow growth. Others have highlighted the role of increased demand for highly experienced workers in an economy undergoing structural changes. The following sub-sections consider these and other factors that have contributed to unemployment in South Africa.

2.1.1. Macroeconomic Policy, Economic Growth and Aggregate Labour Market Trends

Although macroeconomic policy and economic growth are not key themes in this chapter, the relationship between growth and employment is an important one, and hence deserves some attention. Macroeconomic policy and economic growth potentially have significant effects on employment and unemployment levels. The sharp rise in unemployment between 1995 and 2001/02 shown in Figure 2.2 came at a time when the Growth, Employment and Redistribution (GEAR) programme dominated the policy front.¹⁸ The policy certainly set ambitious growth and employment targets: GDP growth was predicted to reach 6 per cent per annum by 2000, which in turn would create an average of 270 000 jobs per annum between

¹⁸ GEAR replaced the Reconstruction and Development Programme in 1996 and remained the official macroeconomic strategy until 2001.

1996 and 2000 (Department of Finance, 1996:7). The GEAR policymakers further envisaged a much more central role for the private sector than its predecessor, the Reconstruction and Development Programme (RDP), specifically as far as investments and capital formation was concerned. In this respect, gross fixed capital formation grew steadily, averaging 5.1 per cent between 1994 and 2003. The economic growth that did materialise, was, however, still inadequate to reduce unemployment and poverty significantly (Bhorat et al., 2005:7).

There is some uncertainty as to whether job creation was positive or negative between 1994 and 2002. The Survey of Earnings and Employment (SEE) conducted by Statistics South Africa suggests that formal employment fell by 12 per cent, which translates into over one million jobs lost. This outcome raised concerns about the ability of the economy to generate jobs through growth, fuelling the so-called ‘jobless growth debate’. While simple output-employment elasticities, which are calculated by expressing the percentage change in employment as a share of GDP growth, may have been negative when using certain data sources, such an approach ignores the impact of factor costs on employment. Hence, in a more careful examination by Fields et al. (1999), also using the SEE data, the output-employment elasticity for the period 1990 to 1998 was actually shown to be insignificantly different from zero.¹⁹ Thus, although strictly speaking the relationship between output and employment could still be described as ‘jobless’, the two are at least not negatively related.

Another criticism of the jobless growth thesis comes from Bhorat (2008), who, like (Casale et al., 2004), questions the validity of the SEE. This dataset, Bhorat argues, has a very narrow sectoral coverage, the most significant exclusions (from an employment perspective) being the agricultural and informal sectors. Comparisons of long-term employment trends are also problematic given inconsistencies in terms of the sectors included in the different SEE datasets. Over a comparable period, the October Household Survey of 1995 and the Labour Force Survey of 2002 already paints a more positive picture than the SEE dataset in suggesting that total employment (formal and informal sector) actually grew by 2.5 per cent per annum.

In many respects the year 2000 marks a turnaround in the economy, which now grew at an increased tempo. Government adopted a more expansionary fiscal policy stance during the ‘post-GEAR’ period and private consumption grew strongly. Employment creation followed and in 2000 alone an estimated 409 000 jobs were created (Oosthuizen, 2005). This strong employment performance continued throughout the period 2000 to 2005. The resurgence of employment growth came at an opportune time for the ANC government, who, during their

¹⁹ They estimate wage- and employment elasticities in standard fashion by estimating a labour demand equation of the form $L_t = \beta + \beta_1 \ln w_t + \beta_2 \ln r_t + \beta_3 \ln Q_t + \varepsilon_t$. L_t represents employment in time period t , while w_t and r_t are labour and capital costs, respectively. Q_t represents output in time period t .

2004 election campaign, were able to claim that the economy had generated 2 million net new jobs since 1995 (see Casale et al., 2004). These claims are substantiated by Statistics South Africa's surveys, but others have questioned whether these jobs have been 'real' or whether this was merely a perceived increase in employment related to changes in the definition of what constitutes having a job (see section 2.2 for further discussions).

On the face of it, and based on the evidence from Statistics South Africa, growth in total employment exceeded growth in both the population and the working age population, even though it was slightly lower than economic growth (Oosthuizen, 2005). Clearly, though, employment growth was still insufficient to make the kind of inroads into unemployment that were needed.

The emerging consensus now is that slow growth or jobless growth is not the only or even the main cause of the stubbornly high unemployment rate; rather, a more balanced assessment is that the economy was simply unable to absorb a rapidly growing labour force between 1995 and 2005. The Labour Force Surveys suggest that the broadly defined labour force grew by 46 per cent between 1995 and 2005 (from 13.8 million to 20.1 million) at an average rate of 3.9 per cent per annum. This rise of 6.3 million people stands in sharp contrast to the 2.8 million jobs created during the same period. Banerjee et al. (2007) show that participation rates among females, Africans and the youth in particular have risen sharply since the end of apartheid. They further show that the unemployment rate in 2005 would have been roughly similar to the level in 1995 had the participation rate remained constant at the 1995 level. This, they argue, is a strong indicator that changes in participation rather than lower employment absorption rates explain much of the change in unemployment seen between 1995 and 2005.

The preceding discussion raises two important points relating to the relationship between economic growth and employment. Firstly, although the economy did not necessarily experience jobless growth, the *level* of growth was certainly insufficient to absorb all new entrants. Some simple back-of-the-envelope calculations suggest that, *ceteris paribus*, GDP would have to grow at 5 per cent per annum just to maintain the current unemployment rate until 2015. Further, if government wished to reach its intended target of reducing unemployment by half in 2015, GDP would have to be maintained at between 8 and 9 per cent per annum.²⁰ This highlights the need for – and indeed importance of – complementary microeconomic policy interventions to stimulate employment demand in South Africa.

²⁰ These calculations are based on the assumption that the labour force continued to grow at 3.9 per cent per annum (the average over the past decade) and that the output-employment elasticity is fixed at 0.8. Given evidence presented by Bhorat et al. (2005) a value of 0.8 perhaps represents a fairly optimistic elasticity value.

The second issue concerns the *type* of growth experienced. Output increases has been characterised by skills-intensification and an overall decline in the labour-intensity of production. Therefore, even during those periods when the economy did grow strongly, much of the growth was attributed to skills-biased technical change that has generally had a dampening effect of demand for low-skilled labour. This issue is explored further in the following sub-section.

2.1.2. *Structural Shifts in Production and Labour Demand*

When considering the trends in the broad and official unemployment rates (see Figure 2.2), a widening of the gap between the two unemployment rates becomes observable, especially from 2001 up until about 2004. This is evidence of a growing share of discouraged jobseekers in the economy. The share of discouraged jobseekers peaked at 49 per cent of the unemployed (broad definition) in 2004, dropping slightly to 42 per cent in 2006. This figure, Borat (2008:2) argues, is a “*powerful indicator of the deeply structural nature of South Africa’s unemployment problem*”.

‘Structural unemployment’ is a term used widely in the South African literature, but it is not always clear exactly what people mean by it. Structural unemployment relates to two distinct trends that have developed in the South African economy. The first is a shift in the sectoral composition in the economy. Most apparent has been the shift in output away from primary and secondary sectors towards services or tertiary sectors (Bhorat and Oosthuizen, 2004), a trend natural to any developing economy. This has brought about a change in the demand patterns for different types of labour due to differences in sectors’ skills composition, as reflected in the increase in demand for skilled labour relative to unskilled workers (Burger and Woolard, 2005). Some studies have attributed these effects to trade liberalisation and shifting trade flows. Bell and Cattaneo (1997), for example, find that “*trade flows have shifted production away from Black intensive sectors towards White intensive (or skill intensive) sectors*”. Dunne and Edwards (2005) believe the direct employment effect of liberalisation has been biased against low-skilled workers because tariffs fell relatively sharply in labour intensive sectors, and particularly those with high shares of low-skilled workers.

A second trend relates to changes in production techniques within sectors. South African firms have in the past decade or more been forced to adopt improved production techniques in order to remain competitive in the face of globalisation, trade liberalisation, and more recently, the strengthening of the currency. Production efficiency gains enable producers to produce a unit of output using fewer inputs than before, thus, depending on the demand-side effect of the resulting lower commodity prices, often leading to a decrease in demand for factors of production. The technical change experienced has been mostly capital deepening in

nature. Borat and Oosthuizen argue that capital-deepening technical change is generally “viewed in a ... negative light due to [its] dampening of the employment-increasing effect of output expansion” (2004:12). Intuitively speaking, however, one would expect greater capital intensity to actually increase the demand for high-skilled workers, albeit sometimes at the expense of low-skilled workers. This is due to the fact that firms demand more skilled workers who are required to operate and maintain capital equipment (Bhorat and Hodge, 1999).²¹

Both these ‘structural’ labour demand effects have given rise to an increase in demand for skilled workers and ultimately the emergence of a skills shortage in the economy. At the other end of the skills spectrum low-skilled and inexperienced workers are ‘structurally’ unemployed, which leads Banerjee et al. (2007) to conclude that unemployment has in some sense become an equilibrium outcome in South Africa, and, moreover, one that is unlikely to correct itself without some form of direct policy intervention.

2.1.3. *The Wage-Employment Relationship*

Labour demand theory suggests that employers adjust their employment patterns in response to changes in relative factor costs. Several South African econometric time-series analyses support the notion of a trade-off between real wage levels and employment (Fallon and Lucas, 1998, Fedderke and Mariotti, 2002, Fields et al., 2000) (see further discussions in Chapter 3). Given this, one possible cause of growing unemployment is the rising cost of employment, both in terms of wage and non-wage costs of employment.

With respect to actual wages, Lewis (2001) estimates that the real wage of South African semi- and unskilled workers increased by 150 percent between 1970 and 1999, while in stark comparison, wages skilled workers rose by approximately 10 percent and those of highly skilled workers declined over this period. These changes in relative wage levels are often offered as a reason for the relatively disadvantaged position of low-skilled workers as far as employment prospects are concerned. Section 2.2 reviews the more recent wage trends, and the suggestion from this analysis is that formal sector low-skilled wages have in fact remained fairly stable over the last decade.

Perhaps, therefore, a more appropriate way of thinking about wage costs is in terms of unit labour costs, and particular the unit labour costs of low-skilled versus skilled workers. In this regard Fedderke (2006) attributes large-scale job losses in agriculture and mining, both of which have historically been important employers of low-skilled workers, to the fact that real

²¹ Borat and Hodge (1999) further decompose the changing labour demand patterns in order to gauge the relative importance of technical change versus structural change in the overall employment change and find that although both had been important, the former had a greater impact in terms of the demands for different types of labour (skilled versus unskilled and low-skilled).

wage costs (driven in part by union demands) outstripped improvements in labour productivity. Evidence by Edwards and Golub (2002), who compare relative wage and productivity levels of different types of factors, and Fallon and Lucas (1998) further attest to these types of employment trends. Based on this evidence in the South African literature, Pollin et al. (2006:32) conclude that although analyses of the wage-employment relationship are marred by weak empirics, reducing unit labour costs “*could be a central feature of policies to attack mass unemployment*”.²²

Non-wage costs are perhaps equally important. The post-1994 period has seen increases in non-wage costs of employment due to stricter labour market legislation and regulation, the emergence of a strong trade union movement and rigidities imposed by bargaining councils (see for example Bhorat, 2008, Fedderke, 2006, and Natrass, 2000). The analysis by Bhorat (2008), in particular, shows that the wages of unionised workers are on average 23 per cent above those of non-unionised workers, while the premium for unionised workers in the bottom quartile of the wage distribution is 30 per cent.

With respect to labour market rigidity, Bhorat (2008) finds that South Africa’s hiring and firing costs are in actual fact low by global standards for upper-middle income countries. However, the legislative provisions for firing workers suggest a relatively high level of administrative rigidity. For this reason, Bhorat (2008:32) argues that direct hiring and firing costs are a secondary concern; instead, legislation that governs dismissals and unfair labour processes and practices should be “*at the heart of the labour market flexibility debate*”. Either way, whether costs are high in monetary terms or high implicitly in terms of compliance with stringent legislation, the legislative complexities involved in dismissing workers in South Africa certainly acts as a deterrent to increased employment and labour market flexibility.

In conclusion, it seems employment demand is sluggish at least in part due to relatively high wage and non-wage costs of employment. Firms tend to substitute workers whose relative costs of employment are rising, and the burden has fallen disproportionately on low-skilled workers. These employment demand trends also display a particular risk management strategy of firms, namely to avoid hiring people whom they think might not succeed in the workplace. Training costs are high (given low skills) and dismissals are procedurally complex, which means employers rather keep posts vacant than to employ people who might not be suitable. In this regard, the youth are at a distinct disadvantage as they often lack the experience that could serve as a signal to potential employers of their abilities. The youth unemployment problem is revisited in section 2.1.5.

²² The reliability of employment and earnings statistics spanning long periods of time is questionable, partly due to changes in sampling and data collection methods during South Africa’s political transition period.

2.1.4. *Job Search Costs and Reservation Wages*

Several factors influence individuals' decisions around labour market participation, and also whether they actively or passively seek employment (the latter group are classified as discouraged work seekers). Many people knowingly lack the skills necessary to find employment in an economy that has increasingly become skill-intensive. Such individuals may want to work, but often choose to not actively seek employment.

There are several other factors that may impede people's ability or willingness to actively seek work, or even their decisions about whether to take up employment opportunities that are available to them. The first such factor concerns the high cost of job search. Citing several studies, Burns (2008) argues that material job search costs in South Africa are high given large geographical distances between areas where employment opportunities mostly exist (i.e. urban areas) and where people reside. Urban jobcentres are furthermore spatially isolated. The youth, Burns (2008) argues, are particularly vulnerable given a lack of mobility and limited resources. Many people rely on word-of-mouth from friends and family to learn about job opportunities. Successful job search through such social networks requires good quality networks, which places the youth and those living in isolated areas at a relative disadvantage.

The second factor relates to wage levels and whether people choose to look for work at the prevailing wage. In the context of excess labour supply at prevailing wages, there is little empirical support for reservation wages in South Africa (Burns, 2008), or put differently, the true reservation wage is below the existing wage. Moreover, the lack of welfare support for able-bodied unemployed persons in this country makes voluntary unemployment an irrational choice. However, related to the reservation wage idea is the issue of the costs associated with taking a job. In some instances, Burns (2008) argues, the costs associated with working (transport costs, having to pay for childcare and so on) actually exceed the wage associated with that job.

Another consideration is the health status of jobseekers. For instance, Burns (2008) writes, the high prevalence of HIV/AIDS among the youth, and young women in particular, may contribute to unemployment since poor health impedes active job search, which reduces employment prospects.

2.1.5. *Revisiting Youth Unemployment*

Youth unemployment is often regarded as particularly problematic from a socio-economic perspective. In a report on *Global Employment Trends for Youth* the International Labour Organisation (ILO) notes that the inability to find employment can create a sense of uselessness and idleness, and that this is especially true for the youth (ILO, 2004). Evidence

presented earlier in Table 2.3 shows that almost three-quarters of the unemployed are under the age of 35. The average unemployment rate among this group is 50.5 per cent, which is significantly higher than that of adults.

When comparing the racial, gender and location profiles of the unemployed youth the picture looks very similar to that of overall unemployment. However, a comparison of educational attainment of the unemployed youth vis-à-vis adult participants reveals large differences, as shown earlier in Table 2.3. In short, the evidence suggests that the unemployed youth are much better qualified than their adult counterparts (see for example Pauw et al., 2008b). Despite this, the youth face much weaker employment prospects than adults. The issue clearly warrants further investigation.

Several supply-side factors listed in the previous section relate directly to youth unemployment. To recap, the study by Burns (2008) finds that the youth are often unable to actively seek work given a lack of mobility, limited financial resources, poor networks and a high incidence of HIV/AIDS. It is intuitive that inactive jobseekers have a significantly reduced chance of finding employment compared to an active jobseeker.

The interest in this section is, however, more on the demand-side. The reluctance of firms to hire young labour market entrants is a fairly common firm behavioural characteristic that is described in so-called ‘overlapping generations’ models. This problem seems to be particularly severe in the South African labour market. This raises several questions around education, skills and experience of youth labour market entrants.

The quality (or perceived quality) of education in South Africa is important in explaining why employers are reluctant to hire young labour market entrants. Over 30 per cent of the unemployed youth have a matric qualification, which, according to Bhorat (2008:6), is a “*stinging indictment of the inability of the ... schooling system to guarantee employment*”.²³ More systematic multivariate approaches to analysing employment prospects (see section 3) confirm that a matric qualification has become less important and even insignificant in determining whether a labour market participant finds employment or not compared to someone without a matric. Rapid growth in labour force participation rates among African youth in particular, as well as the fact that people are entering the labour market at an earlier

²³ Serious questions have been asked about the quality of education offered in South Africa, particularly to African pupils. A detailed discussion falls beyond the scope here. In short, though, as argued by Bhorat (2008), the significantly higher quality and effectiveness of schooling offered to White labour market participants relative to Africans (he cites several studies to substantiate this claim) results in an outcome where White and African participants with the same qualifications do not face the same employment prospects. This ‘schooling quality effect’, he explains, is not adequately captured by the education variable in the Labour Force Surveys, which means that the significant race effects found in these multivariate employment equations may in part be proxy for the impact of poor quality education attained by African jobseekers.

age and with higher education levels than in the past, has further increased competition for entry-level jobs (Branson, 2006, Pauw et al., 2008b). This implication is that a matric may simply not be good enough any longer to guarantee employment.

The South African economy has become increasingly skills-intensive, with employers placing a premium on previous work experience when hiring workers. In fact, many South African firms face serious skills shortages, which is one of the reasons why the *Joint Initiative on Priority Skills Acquisition* (JIPSA), a task team within The Presidency, was launched. Even though there are many jobseekers, many South African firms remain understaffed, choosing to rather keep positions vacant than fill them with people who do not have the right experience.

The youth are once again at a disadvantage as far as experience is concerned. Evidence from the LFS September 2005 suggests that younger people are much less likely to have previous work experience. On average, over three-quarters of the unemployed youth have never worked before, compared to 'only' to 46.2 of unemployed adults. The suggestion is that young people, despite being better educated, simply cannot compete with older, more experienced workers when applying for jobs due to a lack of skills and previous work experience. This ultimately puts the education system in a bad light.

2.2. The Evolution of Wages

Casale et al. (2004) rightfully argue that an evaluation of labour market trends is incomplete without also considering the returns to employment or wage trends. Their study sets out with the aim of critically reviewing claims by the ANC government in 2003/04 that 2 million net new jobs had been added to the economy since 1995.

While total employment as reported in the OHS 1995 and LFS 2003 did indeed rise from 9.6 to almost 11.6 million, several definitional and data capturing changes are worth noting. Firstly, the definition of what constitutes having a job changed with the introduction of the LFS in 2000. Under the new survey, even "*one hour in the previous week*" was enough to be classified as employed (Casale et al., 2004). At the same time there was a marked effort to better capture informal sector workers. The total change in employment between 1999 and 2000 alone was 14 per cent, which is well above the 2.3 per cent average annual increase in employment between 1995 and 2003.

Secondly, subsistence farmers were only captured as employed in the latter OHSs. By 2003 this group made up 300 000 of the 11.6 million workers in the economy, which is a sizable portion of the 2 million 'new jobs' created between 1995 and 2003. Thirdly, the LFS 2003 was the first LFS survey to be reweighted using data from the National Census 2001. In that

same year, employment increased substantially (by 500 000), i.e., one quarter of the new jobs created in the eight years since 1995 were seemingly created in the final year alone.

Both employment and wage trends should be viewed in light of these data collection changes. Most important, perhaps, is the fact that over 1 million new jobs were created in informal self-employment (760 000) and subsistence agriculture (300 000) alone (Casale et al., 2004). Formal sector employment (self-employment and employees) growth accounted for less than 40 per cent of the total growth in employment.

So what happened to average wages? Table 2.4 shows the real average monthly wages of workers as estimated by Casale et al. (2004) (all wages are expressed in 2000 prices). According to these estimates the average wage declined from R3 014 in 1995 to R2 360 in 2003, a decline of about 20 per cent. Burger and Yu's (2006) estimate for the 1995 to 2005 period shows a decline of 23 per cent, with wages dropping by 38 per cent between 1999 and 2000 alone with the adoption of the LFS 2000. This translates into an average annual real decline of 2.1 per cent.

Table 2.4: Real Monthly Wages: 1995 to 2003

	OHS 1995	OHS 1997	LFS 2000	LFS 2001	LFS 2002	LFS 2003
Subsistence agriculture	-	-	84	165	89	102
Other agriculture	-	-	681	1,004	827	827
<i>Total agriculture</i>	<i>690</i>	<i>691</i>	<i>357</i>	<i>781</i>	<i>574</i>	<i>608</i>
<i>Domestic work</i>	<i>585</i>	<i>677</i>	<i>524</i>	<i>481</i>	<i>421</i>	<i>473</i>
Formal self-employed	14,081	9,441	5,424	6,447	6,602	7,599
Informal self-employed	3,352	1,684	1,154	971	988	968
<i>Total self-employed</i>	<i>6,866</i>	<i>4,441</i>	<i>2,232</i>	<i>2,261</i>	<i>2,360</i>	<i>2,610</i>
Formal employees	-	3,060	3,161	3,153	3,182	2,986
Informal employees	-	1,389	1,037	1,030	888	891
<i>Total employees</i>	<i>3,191</i>	<i>2,642</i>	<i>2,944</i>	<i>2,958</i>	<i>2,999</i>	<i>2,805</i>
All formal workers	-	3,339	3,290	3,340	3,371	3,241
All informal workers	-	1,523	1,109	991	956	941
All employment	3,014	2,812	2,292	2,454	2,412	2,360

Source: Casale et al. (2004) based on OHS 1995, OHS 1997 and LFS 2000 to LFS2003

So what does this tell us? First of all, it is worth noting that informal sector wages have always been significantly lower than formal sector wages, and also that this gap has widened over time. An increase in the share of informal sector workers in the economy will therefore automatically lead to a decline in the economy-wide average wage. Burger and Yu (2006) derive what they argue is a more 'comparable earnings series' by excluding informal and self-employed workers as well as obvious outliers from the sample. The resulting dataset shows that semi-skilled wages declined by about 0.8 per cent on average every year, while unskilled wages declined by 0.9 per cent. Skilled wages, in turn, increased by an average of 1

per cent every year in real terms between 1995 and 2005. These changes are consistent with skills-biased technical change, shortages of skilled workers and an excess (and increasing) supply of low-skilled workers.

The apparent trend of ‘informalisation’ of the labour market can also be interpreted in two ways. On the one hand it should be cause for serious concern. The data suggests that formal sector employment demand is stagnant – possibly due to more stringent labour market regulation and skills-biased technological shifts – and the only option for low-skilled workers is to pile into the informal sector where wages are declining at a rapid pace. On the other hand, one could argue that the magnitudes of these shifts (in particular the drop in informal wages) came too suddenly and is much too large over the ten-year period to be plausible; instead, as Burger and Yu (2006:6) argue, these “*trends are mainly driven by Statistics South Africa’s improved ability to capture low-paying informal activities*”. The suggestion of a such a line of reasoning is that many people were previously captured as unemployed or inactive when they should have been captured as employed, and hence estimates of average wages were biased upwards prior to the LFS 2000.

Whatever one’s viewpoint is, the first policy lesson is that job creation in the formal rather than the informal sector is the preferred route. This presents a strong case for a policy such as a wage subsidy offered to formal sector employers. Formal sector jobs are more sustainable and formal sector work experience is more beneficial to workers (see Chapter 3). A second policy lesson is that declining wages is not, as many people would want to argue, a justification for minimum wages in South Africa. Much of the decline in the average wage is related to strong growth in informal self-employment – and clearly there is no sense in implementing minimum wages for the self-employed. However, what remains true is that many South Africans, despite being employed in formal or informal sector firms, are still not able to escape poverty. A minimum wage policy for these workers may therefore still have merit as a tool to address poverty.

3. Determinants of Employment and Earnings

The preceding analysis of unemployment, low earnings, skills deficits and education has been mostly descriptive in nature. A more nuanced approach to unravelling the link between education, participation, employment and earnings is to estimate econometric equations that help identify the determinants of labour force participation or earnings and the probability of finding employment following the principles laid out by Heckman (1979). Such ‘occupational choice models’ as they are sometimes called are not only useful from a descriptive point of view, but can also be applied in ex ante labour market models in which changes in participation and earnings are predicted or where individuals that might benefit or

lose out during employment expansions or contractions are identified (see Chapter 4 for a detailed discussion).

Bhorat and Leibbrandt (2001) estimate various occupational choice models and find that education already plays an important role in determining whether an individual participates or not. The significance of education as a determinant of participation increases when the strict definition of employment is used. This, they explain, “*is manifested in much better educational qualifications amongst participants relative to non-participants when non-participants are dominated by discouraged work seekers*” (Bhorat and Leibbrandt, 2001:118). Put differently, among the broadly unemployed, the active work seekers are generally better qualified than the discouraged work seekers. More recent estimates of labour market participation (see for example Oosthuizen, 2005, and Van der Westhuizen et al., 2007) corroborate the earlier findings of Bhorat and Leibbrandt (2001).

As expected, education is also a key determinant of a participant’s probability of finding employment, with those with lower levels of education being more likely to remain unemployed (Bhorat and Leibbrandt, 2001). Oosthuizen’s (2005) study confirms this, but notes an interesting change between 1995 and 2004. Ten years ago, a matric qualification raised a participant’s probability of finding employment well above that of someone without it, but this relative advantage had since diminished significantly. This suggests that the stakes have been raised; in order to effectively compete for jobs in the modern economy a post-matric certificate, diploma or degree has become much more important. This finding reflects, firstly, the relative increase in the labour supply of matrics, and, secondly, the relatively strong growth in demand for higher-skilled labour vis-à-vis lower skilled workers, which is a prominent feature of the structural changes experienced in the economy.

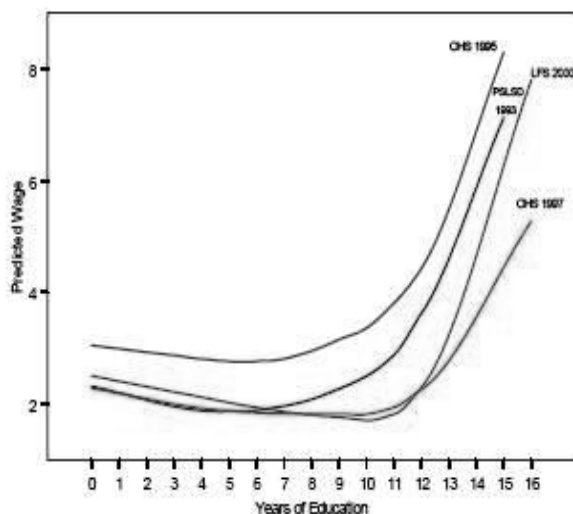
Bhorat (2008) notes that race in particular remains a strong predictor of employment probabilities, but argues that this variable stands proxy for a range of omitted variables in these kinds employment equations. Most important of these omitted variables, he argues, is the significantly higher quality and effectiveness of schooling offered to White labour market participants. This is reflected in larger class sizes, as well as better physical and ‘knowledge’ infrastructure in former White schools compared to former African schools. This means that the significant race effects found in these occupational choice models may in part be proxy for the impact of poor quality education attained by African jobseekers. Other omitted variables, Bhorat (2008) argues, may include language effects, parental income, social networks and peer effects, none of which can be tested econometrically within the confines of the labour force surveys in South Africa.

The earnings equations estimated by Bhorat and Leibbrandt (2001) show an interesting yet somewhat controversial relationship between wages and education. Primary and secondary

schooling, they find, are important in increasing earnings, but each additional year of tertiary education is not. The implication of this seems to be that while a tertiary qualification is crucial in determining whether an individual is likely to gain employment, it is less important in determining that individual's earnings once they have a job.

These findings were challenged by Keswell and Poswell (2004). They use several datasets and a variety of functional forms and estimation techniques to test the robustness of econometric results on educational returns in proving that there is in actual fact a strong convex relationship between education and earnings (see Figure 2.3). Their findings show that the marginal returns to education are initially close to zero (or even negative depending on the estimation technique and/or functional form selected) at low levels of education, followed by a particularly sharp rise in the return structure at about twelve years of schooling (i.e., as scholars move into tertiary education and beyond). Incidentally, Keswell and Poswell (2004) show that when controlling for experience, the slightly negative returns to education at low levels of education disappears, suggesting that this effect may have more to do with age or experience effects than with education itself.

Figure 2.3: Convex Returns to Education: Evidence for South Africa, 1993 to 2000



Source: Keswell and Poswell (2004)

Given limited financial resources and their location, poor people are generally less likely to obtain higher degrees than their non-poor counterparts. Evidence from the IES/LFS 2000 shows that just less than 50 per cent of poor people (i.e., those in the bottom two household quintiles) of working age have never progressed beyond primary school. In contrast, only 20 per cent of non-poor people of working age only completed primary school. This implies that those among the poor that are fortunate enough to find employment are quite likely to be caught in an 'earnings trap' denoted by the flat sections of the returns to education curves

estimated by Keswell and Poswell (2004). Wages earned by the working poor are then often shared among much larger families as we have seen (see Table 2.1 and Table 2.2 earlier), thus causing the entire family to be in poverty, despite being attached to the labour market.

4. Concluding Remarks

Given the centrality of the labour market in the determination of poverty, any policy that raises employment or wage earnings has the potential of being a powerful tool in the battle to eradicate poverty. Strong economic growth will always be crucial in generating more jobs and reducing poverty. However, in the interim, direct interventions in the labour market may be necessary. Torres et al. (2000) identify four distinct sets of instruments that can be used in labour market policy. First, there are those that aim to create more employment opportunities for the unemployed. Second, there are those that directly target wage income levels of the (working) poor. The third is a long-term approach aimed at increasing skills levels in the labour force, a policy that will allow people to compete for better quality jobs that offer higher wages. Finally there are those policies aimed at improving the bargaining power of workers, thus allowing them to negotiate better conditions of employment.

The analysis here has shown that the South African poverty problem can be linked to at least two key labour market features. The first is the high level of unemployment. Over two-thirds of the unemployed are poor and typically lack the skills and means required to effectively compete for jobs. The second is very low wages, or more broadly speaking, the low earnings potential of workers. Once income sharing and the fact the wage earners have many dependants are taken into account, it becomes clear that wages (of low-skilled workers in particular) are simply not sufficient to allow these workers and their families to escape poverty.

With this background information in mind, the focus in this turns to labour market policies that have the potential to raise employment or wages. In particular, we consider minimum wages and wage subsidies, both of which can be described as wage-based policies in that the primary intervention is through a direct (minimum wages) or indirect (wage subsidies) adjustment of wages. Chapter 3 elaborates on the theoretical and design aspects of these two policy approaches and argues their merits, limitations and design options.

Chapter 3. Labour Market Theory and Policy: The Case for Minimum Wages and Wage Subsidies

In this chapter two ‘wage-based’ labour market interventions, namely minimum wages and wage subsidies, are analysed from a theoretical perspective. Both these policies use wages as the main policy lever to effect a change in the market outcome, and hence any theoretical overview of the likely impacts of these policies should start with a review of the relevant labour market theory that explains employment responses in the economy. Section 1 therefore introduces the basic theoretical concepts around the wage-employment relationship as presented in the standard neo-classical theory of labour demand. Sections 2 and 3 then consider in more detail the theory and rationale for the implementation of minimum wage and wage subsidy policies. The aim is to provide the theoretical background needed in order to understand what the likely impacts of these policies in terms of employment, income and poverty effects might be. As such, where appropriate and relevant, the chapter will introduce some specific modelling issues around labour market policy and poverty impact analysis, but mainly as an introduction to the more in-depth discussion on modelling approaches that follows in Chapter 4. Section 4 draws brief conclusions.

1. Wages and Employment Responses

1.1. Theory of Labour Demand

Both minimum wages and wage subsidies use wages as the primary policy lever in order to bring about change in the labour market. The primary outcome of an exogenous change in the wage is a change in the employment level. Given the standard assumption of an inverse relationship between wages and employment, minimum wages are likely to lower

employment levels, while wage subsidies have the opposite effect. When evaluating the impact of these policies on welfare and poverty in the economy, the way in which the employment effect is modelled is critical.

Neo-classical economic textbooks typically use a simple partial equilibrium approach to explain the impact of such wage changes on employment levels. The operating parameter is the wage elasticity of labour demand (η_L), which is defined as the marginal change in employment for a given change in the wage.

$$\eta_L = \frac{\% \Delta L}{\% \Delta w} \text{ or } \eta_L = \frac{d(\ln L)}{d(\ln w)} \quad [3.1]$$

Knowledge about the value of wage elasticity parameter, either within economic sectors or at the economy-wide level, is a useful start towards understanding the impact of the policy. By reorganising equation [3.1] the marginal employment effects associated with a specific change in the wage can be calculated as $\% \Delta L = \eta_L \% \Delta w$. Thus, for a given change in the wage, the change in employment experienced depends on the size of the wage elasticity parameter.

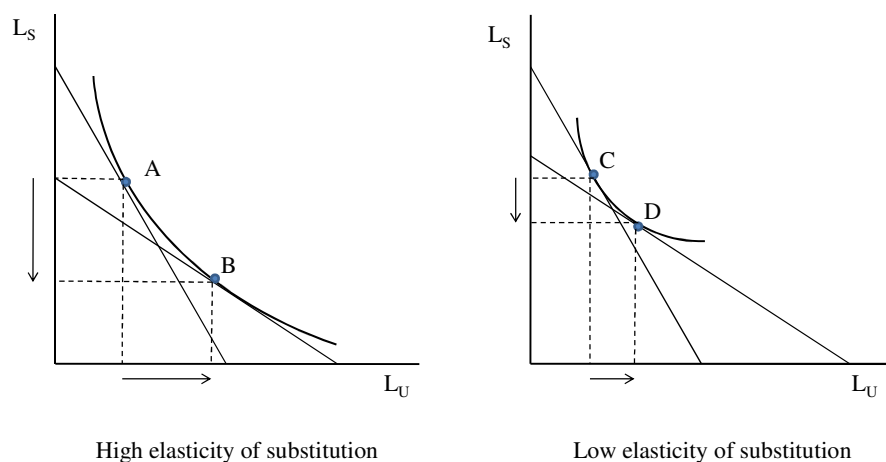
A partial equilibrium analysis of employment changes at a national level ignores differential effects within economic sectors. Sectoral partial equilibrium analyses improve slightly on this, but still only consider direct employment effects within economic sectors and in isolation from one another; the interdependencies between sectors are ignored. Furthermore, partial equilibrium analyses of wage changes targeted at specific workers within sectors ignore the employment impacts that these policies may have on non-targeted factors of production. In reality firms employ a variety of different types of primary factors of production. This may include capital, land and various different types of labour, such as skilled, semi-skilled and unskilled workers. The wage elasticity as expressed in equation [3.1] is also sometimes referred to as the partial *own-price* elasticity of demand, as it only deals with the employment changes for that factor affected directly by a change in its own wage.

In a general equilibrium setting, firms' employment decisions take the employment of *all* primary factors of production into consideration. The combined contribution of the factors of production is typically called 'value added'. The fundamental assumption is then that producers can choose between various combinations of primary factors of production that will, when combined in a production process, will all yield the same value of output. These input choices represent alternative production technologies available to the firm. If, for example, the primary inputs consisted of capital, skilled labour and unskilled labour, producers could decide to follow a more capital-intensive production technique, thus employing relatively more machinery and equipment and fewer labourers per unit of value

added. Alternatively, a high-skilled intensive production strategy could be followed by employing relatively more skilled workers and fewer unskilled workers. The choice of production technology is ultimately driven by relative factor costs: if capital is relatively more expensive, a more labour-intensive process will be followed, and vice versa.

In practical applications the substitution possibilities in the value added function is typically modelled using either a Cobb-Douglas (CD) or a more flexible CES function.²⁴ In a simple two-input case (say workers and capital, or skilled workers, L_S , and unskilled workers, L_U) the CD or CES function is represented by an isoquant, a smooth curve that is convex with respect to the origin. Two possible scenarios are sketched with the help of Figure 3.1 below. The vertical axes in each of these graphs represent skilled employment, while the horizontal axes represent unskilled employment. Initially, in the diagram on the left, the firm's profit maximising level of employment is achieved at point A. In the event of a reduction in the wage of unskilled workers relative to that of skilled workers, the firm's isocost line becomes flatter (the slope of the isocost line is given by the ratio of unskilled wages to skilled wages). The firm's production costs can now be reduced by substituting employment away from skilled labour towards point B while still maintaining output at the original level (output is represented here by the curved isoquant).

Figure 3.1: Firm-level Analysis of Substitution along a Production Isoquant



In economic models the ease with which producers can substitute between different factors of production is determined by the elasticity of substitution (EOS), which enters into the CD or CES value-added production function as a parameter. A high EOS indicates a high degree of

²⁴ More recently the use of a translog function has become popular. Such a function allows for a specification whereby by some factors production are complement and others substitutes. Go et al. (2009) adopt such a functional form and assume that due to structural reasons unskilled and skilled workers in South Africa are actually complements. As we show in the Appendix (section 4.2.3) their application to wage subsidies yields very different employment effects. While this partly relates to difference in simulation setup, it mainly reflects differences in the way factor demand is modelled.

substitutability between the primary factors and vice versa.²⁵ The right hand diagram in Figure 3.1 illustrates the employment effects of a similar change in the relative factor costs as in the left-hand diagram, only now under a low elasticity scenario. As can be seen from the figures the EOS affects the curvature of the isoquant, and hence also the extent of the substitution (in this low elasticity scenario from points C to D). From a modelling perspective, therefore, the extent of the employment effect observed depends crucially on the size of the EOS parameter assumed or estimated for a particular sector or for particular factors of production.²⁶

A general equilibrium approach allows for the evaluation of the impact of a change in the wage of one factor of production on employment levels of that factor as well as other factors of production employed in the same production process. Whereas in a partial equilibrium model the employment change depends on the wage elasticity, it depends on the EOS between various factors of production in a general equilibrium model. It follows that the wage elasticity (η_L) and the EOS (σ) have to be related. Hamermesh (1993) shows this relationship to be:

$$\eta_L = -(1-\tau)\sigma < 0 \text{ where } \tau = \frac{wL}{P.Q} \quad [3.2]$$

In this expression the symbol τ represents labour's share in the value of output (or a particular subset of labour, e.g. low-skilled workers). This share is calculated as the ratio of the wage bill ($w.L$) to total revenue ($P.Q$), where P represents the price of the underlying goods produced by the firm. As τ becomes very small, η_L and σ are very similar. Thus, in models where factor accounts are highly disaggregated, τ is small and the distinction between the wage elasticity and the EOS is less pronounced.

²⁵ For the CD function $\text{EOS} = 1$. The more versatile multiple-input CES value added function is defined as $QVA = A \left[\sum_i \delta_i F_i^{-\rho} \right]^{-\frac{1}{\rho}}$ where A is an efficiency or shift parameter, and δ_i ($0 \leq \delta_i \leq 1$) is a share parameter. The parameter ρ ($-1 \leq \rho < \infty$, $\rho \neq 0$) is the substitution parameter or function exponent, which is related to the EOS (σ) as follows: $\sigma = \frac{1}{1+\rho}$ ($0 \leq \sigma \leq \infty$). The CES function is not defined for $\rho = 0$

due to division by zero. However, using L'Hôpital's Rule it can be shown that as $\rho \rightarrow 0$ (and hence $\sigma \rightarrow 1$), the linearly homogenous CES production function approaches the linearly homogenous CD function. Also, as $\sigma \rightarrow \infty$ the CES function approaches a linear production function (perfect substitution), while, as $\sigma \rightarrow 0$, the function approaches a Leontief fixed input-output production function (no substitution possible).

²⁶ In some sectors it may be harder to substitute between different types of factors of production than in other sectors. Consider for example the construction of a skyscraper. It would be technically infeasible to substitute a 100 foot crane for construction workers. In the agricultural sector, however, it may be more feasible to replace a tractor (say) with a number of workers and still maintain output levels.

Partial equilibrium models evaluate changes in a single market (say the market for low-skilled workers) in isolation from other markets, treating the impacts in other markets and/or sectors as exogenous. This ignores various important interrelationships between different agents and markets in the economy. All these indirect effects are considered in a general equilibrium model. In the context of labour market policies, two important indirect effects can be considered. The first are income effects. Minimum wages and wage subsidies (for example) impact on wage earnings and/or employment levels. This implies that the spending capacity of households is affected, leading to a change in household consumption, which has further indirect employment effects on the economy. For this reason wage-based policies are said to have a substitution effect (as has been illustrated) as well as a scale (or a ‘macro demand-side’) effect. Scale effects, as the name suggests, relate to changes in the scale of production due to demand changes, and are represented by moves to higher or lower production isoquants.

The second type of effect is a price effect. As we shall see in sections 2 and 3 below, both minimum wages and wage subsidies alter employers’ production costs. Minimum wages, for example, cause production costs to rise. Although this is partly mitigated by substituting away from the more expensive factor of production, at least some of these costs are passed on to consumers in the form of higher prices, especially when substitutability is low. Wage subsidies have the opposite effect, i.e. the subsidy (if payable to the firm) reduces the unit cost of labour and hence the unit cost of production. These savings are passed on to consumers. Consumers respond to relative changes in commodity prices by altering their consumption bundles and/or levels of consumption. At a sectoral level such changes in demand will also induce a change in production levels.

Clearly, the relationships between wages, employment responses, prices and consumers’ behavioural responses (demand effects) are important. Hamermesh (1993) shows that in a competitive market a one per cent rise in the wage will cause consumer prices to rise by labour’s share of revenue (τ). Since all firms face the same wage increase, the price increase will be across the board, and hence, given a downward-sloping demand curve in the commodity market, demand will fall and output will decline. This effect is due to the fact that output levels in a perfectly competitive environment are driven by demand levels, which is why labour demand is also sometimes called ‘derived demand’ – it is the demand for labour derived from the demand for commodities produced by those workers. We can now define the ‘total wage elasticity’, which is represented by η'_L in equation [3.3] below, as a function of the wage elasticity and the price elasticity of demand for the product (η_P):

$$\eta'_L = -(1-\tau)\sigma - \tau\eta_P \quad [3.3]$$

The product $\eta\eta_p$ reflects Marshall's second law of derived demand, and shows that labour demand is less elastic when demand for the product is less elastic.

In summary then, the Hicks-Marshall laws of derived demand identify a number of factors that will influence the own-price elasticity of labour demand in an industry. The wage elasticity will be high if (1) the price elasticity of demand for the product produced in that industry is high, (2) when other factors of production are easily substituted for that category of labour, (3) when the supply of other factors is highly elastic (production costs are unlikely to increase too much as demand for other factors increase), and (4) when labour costs of the particular category of labour make up a large share of total costs. All these laws pertain to scale and substitution effects associated with a change in relative factor costs, as discussed in the previous sub-section.

The preceding discussions further illustrate the important interrelationships between wage elasticities, elasticities of substitution and the price elasticity of demand. It also illustrates why it may be important to consider all the direct *and* indirect price and demand effects when modelling the impact of labour market policies on the economy. Partial and general equilibrium models are discussed in more detail in Chapter 4.

1.2. Wage Elasticity Estimation: The Example of South Africa

Estimating wage elasticities econometrically is one way of exploring the trade-off between wages and employment levels. Although this sub-section is mainly intended as a theoretical review of wage elasticity estimation and difficulties associated with it, it draws on South African wage elasticity estimates for illustration purposes. The study by Fallon and Lucas (1998) produced some of the most widely cited sets of wage-employment elasticities for South Africa. A comparison of these estimates with those from other studies illustrates just how sensitive estimates can be to data and methods used, as well as assumptions made. The standard approach to estimating wage elasticities starts with an estimation of labour demand equations, based on the assumption that firms' employment decisions can be modelled as a CES production function (see discussion earlier). Hamermesh (1993) explains that by expressing the CES function in cost terms, partially differentiating with respect to the wage and then taking the natural logarithm yields a labour demand function of the form

$$\ln L_i = \alpha - \sigma \ln w_i + b \ln Q_i \quad [3.4]$$

where L_i and w_i are the employment and wage levels respectively in a given sector (or even at the firm-level), Q_i is the level of output for the sector or firm, α is a constant term, and b and σ are model coefficients, with the latter representing the EOS.

In Fallon and Lucas's (1998) estimation model capital stock levels are assumed to be exogenous, while employment levels of white workers are endogenous. Their approach produces a set of long run wage elasticities, by economic sector, for black employees. These estimates, presented in Table 3.1 below, show a high degree of variation between sectors. The mining sector has a fairly low elasticity of -0.15, which stands in contrast to the much higher elasticity in the services sector (-0.95). The average for the manufacturing sector is -1.0. The authors admit that their estimate for the manufacturing sector is perhaps too high, driven by very high estimates in at least two of the manufacturing sectors, as is quite evident from Table 3.1. Fallon and Lucas (1998) also calculate a national average elasticity of -0.71. This national wage elasticity is a weighted mean estimate of all the sectoral wage elasticities, and has almost become the benchmark wage elasticity used in South African labour market studies.

Table 3.1: Sectoral Wage-Employment Elasticities for Black Formal Sector Workers

Economic Sector		Long Run	Impact
Manufacturing	Beverages	-0.184	-0.095
	Tobacco	-0.057	-0.018
	Textiles	-0.984	-0.346
	Wearing apparel	-2.508	-0.709
	Wood products	-0.196	-0.603
	Furniture	-0.364	-0.139
	Chemicals	-1.166	-0.344
	Rubber and plastic	-0.243	-0.153
	Non-metals and minerals	-2.929	-0.451
	Basic metals	-0.758	-0.166
	Fabricated metals	-0.466	-0.175
	Non-elec machinery	-0.632	-0.408
	Transport equip	-0.440	-0.201
Other sectors	Mining	-0.146	-0.118
	Construction	-0.554	-0.360
	Service	-0.948	-0.147
National average		-0.709	-0.156

Source: Fallon and Lucas (1998)

In another South African study Fields et al. (2000) calculated elasticities for the South African private sector. They also find significant variation in elasticities between different sectors. At a national level they come up with estimates of -0.35 for the period 1990 to 1993 and -0.53 for the period 1994 to 1998. On the basis of these (statistically significant) estimates they argue that the elasticity has increased over time, although their estimates are still somewhat lower than those obtained by Fallon and Lucas (1998). Fedderke and Marriotti (2002) analysed manufacturing sector data and concluded that the average wage elasticity in the manufacturing sector lies between -0.50 and -0.55, which is slightly higher than Fields et al.'s (2000) estimate of -0.45 for this same sector between 1994 and 1998.

Balcombe et al.'s (2000) wage elasticity estimates for the agricultural sector suggest a similar responsiveness as the manufacturing sector (-0.59). However, Conradie (2004) points out that substantial variation may be expected within different types of farms given differences in labour costs as a share of production costs. Her estimates suggest that wage elasticities on wine and table grape farms are -0.33 and -0.59 respectively, while wage elasticities are lower for regular as opposed to seasonal workers (-0.21 and -0.44 for male labourers).

The South African studies cited here concur that there is a negative relationship between wages and employment levels, and further that the wage elasticity is inelastic. This means that for a one per cent rise in the wage, employment will decline by less than one per cent. The estimates are in line with international evidence. A literature review by Hamermesh (1993) finds that the constant-output wage elasticity for 'general employment' probably lies between -0.15 and -0.75, with -0.30 representing a good guess.

However, the estimation of elasticities appears to be quite sensitive to the sectors studied and the time period analysed. In response to Fallon and Lucas's (1998) estimates, Pollin et al. (2006) note that just six years prior to this Fallon also produced employment elasticities, only this time coming up with a national weighted average of -0.28. While their later estimate is perhaps, as argued by Fallon and Lucas (1998), more in line with those of other developing countries, Pollin et al. (2006: 26) write "*the large shift in their own estimate underscores the difficulties in providing generalisations on this matter*". In the case of South Africa, "*the remarkable historical and institutional changes that [the country] has undergone in the past 30 years – as well as the inadequacy of data on employment under the apartheid regime*" further adds to the difficulties around estimating wage elasticities.

Pollin et al. (2006) are further concerned about Fallon and Lucas's (1998) reporting of so-called impact elasticities (see Table 3.1), defined as the wage elasticity over a one-year period. This is reported as -0.16 for the economy as a whole, which suggests that it would take over four-and-a-half years for the full (long run) effect of a wage increase or decrease to work its way through the economy. Pollin et al. (2006) argue that many other exogenous shocks would impact on the economy over such a long period, making the effectiveness of wage changes as a policy tool to affect employment levels uncertain.

Hamermesh (1993) affords the wage elasticity estimation problem some attention, and in particular writes about the problem of aggregation. The problem has two dimensions; firstly, it concerns the estimation of elasticities at a sectoral level and how to aggregate these to obtain meaningful estimates for the economy as a whole. Secondly, it concerns the grouping of labour, i.e. the choice about how labour should be aggregated to form representative groups to be included in the estimation models. The first point is easily illustrated with the help of equation [3.4]. Aggregating to a national level simply involves adding up

employment levels and averaging wages across individual units (firms or sectors, as represented by the subscript i in the equation). Such linear aggregation yields the following aggregate labour demand function:

$$\ln\left(\sum_i L_i\right) = \alpha' - \sigma' \ln\left(\sum_i w_i\right) + b \ln \sum_i Q_i \quad [3.5]$$

In comparing equations [3.4] and [3.5], Hamermesh (1993) points out that there is no reason to expect that $\sigma' = \sigma$ or even that $b = 1$.

The second aggregation problem is around the grouping of labour and the implicit assumptions that go with it. No two workers are perfectly substitutable, yet when workers are grouped through linearly adding up employment levels of a particular group and using the average wage of the group in the estimation, the assumption is effectively that workers within a group are perfectly substitutable or homogeneous. Mathematically this implies that the elasticity of substitution between workers i and j within a group tends to infinity ($\sigma_{ij} \rightarrow \infty$). Aggregation is unavoidable if the aim is to come up with a manageable set of wage elasticities. Therefore, when aggregating, care should be taken to group workers that are indeed 'similar', something that will always remain a great challenge and one that general equilibrium modellers are frequently faced with (see Chapter 4).

1.3. Challenging the Notion of a Wage-Employment Trade-Off

The South African studies cited earlier are in agreement that there is a trade-off between wages and employment, i.e. wage elasticities are negative and statistically significantly different from zero. However, the notion of a trade-off between wages and employment levels has been challenged outright. Findings of a number of case studies conducted by Card and Krueger (1995:393) in the United States all show that both wages and employment levels improved after the introduction of minimum wages in various sectors. Employment gains reported were not always statistically significant, but at least, they argue, employment declines were never reported. Importantly though, is the fact that their case studies all focused on a fairly short period (1 to 3 years at the most). Elasticities are understandably small and possibly insignificantly different from zero over such a short period. While the authors suggest that long term analyses are necessary to complement their research, they caution against these given the difficulties in isolating other exogenous shocks that affect employment levels in the long run, as well as the eroding effect of inflation on real wage levels.

In his literature review on the same subject Hertz (2002) raises the issue of whether it is in fact reasonable to assume that the wage elasticity, which is typically estimated at the average wage, can be used in ex ante minimum wage analyses. The elasticity with respect to the

average wage is a different elasticity than with respect to the minimum wage, i.e. the employment response will be sensitive to the *level* at which the minimum wage is set relative to the prior average. Thus, if the minimum wage is low relative to the prior average wage, the employment response is likely to be small, and vice versa. This concern is not necessarily restricted to a minimum wage context, i.e. this is an important issue irrespective of the direction of the wage change.

The microeconomics literature also provides an explanation for the occurrence of positive wage elasticities in its monopsony model. Although the model is often dismissed as an “*intellectual curiosity*” (Card and Krueger, 1995), it introduces the notion that the existence of market power could lead to a situation where moderate wage increases (due to minimum wages for example) might not lead to a decline in employment as perfect competition models would suggest.²⁷ A monopsonist is defined as a significant purchaser of labour. Therefore, since its labour supply curve is essentially the upward-sloping supply curve of the entire market, it must offer higher wages when it wishes to attract more workers. Given the existence of market power, the marginal revenue product of labour is equal to the marginal cost of labour in equilibrium, but this is still greater than the wage offered. This implies that the marginal worker is still profitable after a rise in the wage, while more workers want to work at this higher wage due to the upward-sloping labour supply curve. The end result is that both employment and wages rise. However, even in this model the wage cannot be increased indefinitely.

2. Minimum Wages

2.1. Theory

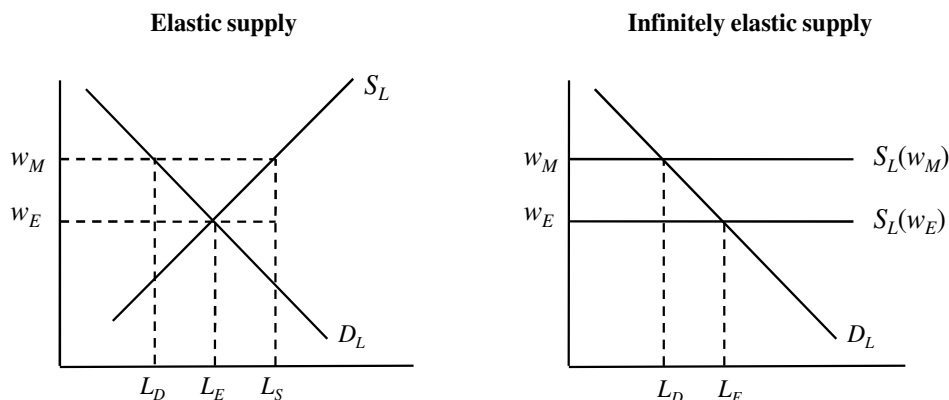
Minimum wages involve setting a floor price which is above the existing equilibrium wage for workers in a certain market. Often minimum wages are targeted at low-wage sectors or occupation groups. Minimum wage policies are politically popular for at least two reasons. Firstly, they represent a straightforward way of redistributing earnings to low paid workers and lifting the working poor out of poverty. Secondly, they are often favoured over other types of labour market interventions as they do not require any additional government spending. For governments facing budget constraints and resistance to increased taxation, minimum wages are certainly an attractive way of redistributing income. Given the features of this policy “*it is probably safe to assume that the minimum wage will continue to attract*

²⁷ Given the prominence that this model still receives in modern microeconomic textbooks, especially when the topic of minimum wages is under discussion, it was considered necessary to include this brief discussion. The monopsony model, however, is not a serious candidate as a model for South Africa’s labour market. As Kuhn (2004:376) argues, unless “*one focuses on workers with very specific skill types in very defined geographical areas, upward-sloping labour supply curves ... seem unlikely*”. This is especially true in a modern era of increased labour mobility and information sharing.

the attention of policymakers” (Card and Krueger, 1995). Developing a better understanding of the employment and poverty effects associated with minimum wages is therefore important.

The single most important criticism against the implementation of minimum wages is that they lead to unemployment. The standard neo-classical textbook explanation of the impact of wage changes on employment levels (in a partial equilibrium context) assumes that the labour demand curve is downward-sloping or elastic (see for example McConnell and Brue, 1999). As shown in the left-hand panel of Figure 3.2 a minimum wage (w_M) set above the initial market wage will lead to employment decline from L_E to L_D . At this wage, however, L_S workers want to work, and hence the distance between L_D and L_S represents unemployment. When mass unemployment exists, such as is the case among low-skilled workers in South Africa, labour supply could be thought of as being infinitely elastic as there are always more people willing to work at the prevailing wage rate. This means that the supply curve for labour (S_L) can be drawn as a horizontal line (see right-hand panel of the figure). In this scenario the minimum wage will lead to employment losses equal to the distance between L_E and L_D , which in this instance represents an increase in the ‘equilibrium’ unemployment level.

Figure 3.2: Demand and Supply of Labour and the Impact of a Minimum Wage



The analysis can easily be extended to the multiple-input case using production isoquants that allow for an analysis of the substitution effect between different factors of production. As discussed earlier with the aid of Figure 3.1, the extent of the employment loss will depend on the wage elasticity of demand in a partial equilibrium context or the elasticity of substitution (EOS) in a general equilibrium context.

2.2. The Rationale for Minimum Wages

The idea that minimum wages will lead to employment losses is frequently challenged in the literature. Reference to some of this literature was made in section 1.3 above. It can be argued that the employment effects depend on the level of the minimum wage relative to market wages, i.e. if the wage increase is moderate, employment levels may be unaffected as employers may decide to mitigate cost increases in ways other than reducing employment levels. This may be particularly true in instances where the costs associated with laying off workers are higher than the minimum wage increase.

Some would argue that the macroeconomic or scale effects of minimum wages are even more important than the debates around whether the microeconomic employment response is significant or not. Proponents of minimum wages argue that if the employment response is inelastic, the wage bill rises, which in turn increases the purchasing power of the working class (Hertz, 2002). Under such an outcome the minimum wage policy will be associated with a demand-side stimulus. While this may be true in a fixed-price context, it still ignores the possible price effects of minimum wage policies. In particular, as we argue in Chapter 5, when the wage elasticity is low, firms are more likely to pass higher wage costs on to consumers in the form of higher prices. This will erode some or all of these macroeconomic gains.

There are also various socio-economic and political arguments in favour of minimum wage policies. The notion that minimum wages reduce poverty levels among the working poor and their families is most frequently offered as a justification. Minimum wages may also simply be about the promotion of fairness and equity in the workplace if issued as a “*moral signal*” to employers. As such minimum wages may simply be about setting a “*benchmark for good wage practice amongst employers*” (Bhorat, 2000:9).

There are also at least two purely economic justifications for the use of minimum wages as a labour market policy option. The first relates to the notion of reservation wages, the argument being that a minimum wage may raise the equilibrium wage above the reservation wage, which will attract additional workers to the market. In terms of this reasoning, minimum wages may be suitable in labour supply-constrained economies, which of course excludes South Africa. (see earlier related discussion in Chapter 2).²⁸

A second economic justification is the ‘efficiency wage argument’, which can be attributed to Joseph Stiglitz (see for example Shapiro and Stiglitz, 1984). The efficiency wage argument was initially developed to explain why some firms pay above-equilibrium wages, also called

²⁸ Incidentally, this same kind of argument can be used to justify the idea of offering a wage subsidy to workers as opposed to firms (see section 3).

efficiency wages, and why then, as a result, unemployment may sometimes persist in the long run. In a perfectly competitive environment with full employment a worker who is fired for shirking on the job will immediately be rehired again. When efficiency wages are paid the worker has an incentive not to shirk, since, in the presence of unemployment, the worker may run the risk of not finding a job again. In effect, therefore, the opportunity cost of being fired is raised by efficiency wages. Ultimately, efficiency wages may lead to increases in worker productivity levels, while they minimise labour turnover and enable firms to attract better quality workers. Productivity increases may also simply arise due to the fact that employers utilise workers more efficiently because mandated minimum wages raise employment costs (McConnel and Brue, 1999).

Although the efficiency wage theory was not necessarily developed with minimum wages in mind, minimum wages may by the same token increase labour productivity among minimum wage earners. In fact, if productivity levels rise by enough, the marginal revenue product of workers may increase to the extent that the minimum wage equals the equilibrium wage and employment losses will be mitigated.

2.3. Policy Design and Implementation

Minimum wage policies are used in both developed and developing countries as anti-poverty measures or as guidelines for good wage practice. As such they are also sometimes tied to basic conditions of employment (this is the case in South Africa; see Chapter 5). A survey conducted by the *International Organisation of Employers* (IOE) in 2006 provides a good idea of what minimum wage policies look like around the world. Over 80 per cent of the 48 countries surveyed by the (IOE, 2006) reported that some form of minimum wage legislature was in place. In addition to this, a large majority of the countries (e.g., 75 per cent of European Union member countries) have statutory or ‘mandated’ minimum wages in addition to collectively agreed wages. There are some interesting models as well: Hong Kong, for example, follows a voluntary approach to minimum wages called a ‘wage protection movement’.

About half the countries in the IOE (2006) survey have a single minimum wage for the entire country, but some countries differentiate between sectors, regions within the country and type of occupation in setting the wage benchmark. Age-specific minimum wages are set in about 9 per cent of the countries. South African is an example of a country with non-uniform minimum wages, while Australia has over 20 000 specific minimum wage levels. Not all sectors are necessarily covered in these countries; e.g., in the United States, people who receive gratuities (services sectors) are exempt. In the case of South Africa, minimum wages were specifically introduced for those not covered by wage bargaining councils.

Minimum wages are either set by institutions or sectors through collective bargaining processes or by government, usually after consultation with stakeholders. Adjustments to the minimum wage are either agreed collectively or increases are linked to inflation. In some countries (e.g., Malaysia) a productivity-linked wage system is in use. More than half the countries surveyed by the IOE (2006) felt the minimum wage level was ‘just right’, which suggests that minimum wages are often set at a level considered to be a fair wage.

However, in some countries (e.g., the United Kingdom) there is fear that the minimum wage has become too high. Employers there compensate for this by cutting benefits and curbing performance-based pay structures. Over time, wage increases of workers above the minimum wage may be curbed to finance minimum wage increases, thus leading to a narrowing of the overall wage distribution (see section 2.4.2 below).

Minimum wage increases or the introduction of new minimum wage policies altogether may also have various other ‘unintended consequences’. For example, in South Africa, minimum wages for domestic workers did not necessarily lead to large-scale job losses, but employees’ hours were reduced, typically without a compensating reduction in the level of output expected by the employer (Hertz, 2005). A likely consequence of regional differences in minimum wages is increased migration from low- to high-wage regions (IOE, 2006), especially when regional wage differences are not founded on differences in living costs. Finally, in China, where minimum wages have been in place since 1993, authorities are reportedly concerned about the impact that minimum wage increases might have on the country’s competitiveness in world markets.

2.4. Theoretical Models for Analysing Minimum Wage Effects

Although labour market and economic modelling is a central theme in Chapter 4, it is worthwhile here to consider some of the models that have been developed to analyse the effects of this type of policy intervention. As we explain in more depth in the chapter to follow, there are two broad approaches that have been followed. The first is an ex post approach whereby, typically, econometric models are used to evaluate the statistical relationships between employment or poverty and wages over time. A South African example of such an approach can be found in Hertz (2005), who uses the series of Labour Force Surveys to investigate domestic worker employment responses to minimum wages in South Africa.

The alternative, and the main focus of attention in this study, is to use an ex ante analytical or modelling framework that allows for the analysis of the impact of changes in wage minima on employment, incomes and poverty in a forward-looking manner. Such ex ante modelling frameworks can either be partial or general equilibrium models. Once again details about the

workings of such models are provided in Chapter 4, but a brief discussion of some ex ante modelling analyses of minimum wage impacts is appropriate in the context of the theoretical overview in this chapter. The discussion to follow therefore serves, to some extent, as an introduction to ex ante modelling of the labour market in general, but it also provides a better understanding of the likely employment and poverty effects of minimum wage policies in particular.

We focus on three types of models that have been described in the literature. The first is the minimum wage-poverty model by Fields and Kanbur (2007), which illustrates the complexity of the wage-employment poverty relationship. The second is the human capital model, which is essentially an adaptation of the standard neo-classical approach to understanding the employment responses to minimum wages (we draw on Card and Krueger's (1995) discussion of this model). Finally, we consider two types of micro-simulation-type models that have been applied in a minimum wage context, namely an analysis by Hertz (2002) that looks at South African minimum wages for domestic workers, and a study by Bird and Manning (2005) that focuses on the production cost aspects of minimum wage policies and how that impacts on households' spending power and welfare levels.

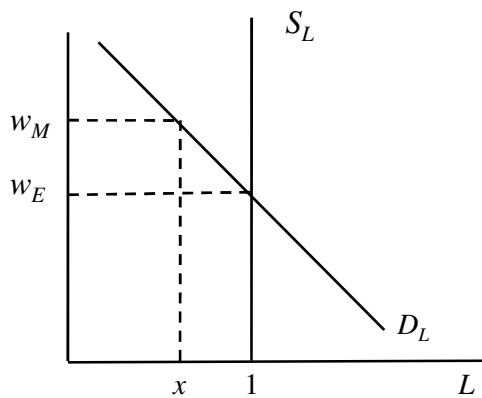
2.4.1. *Fields and Kanbur Model*

Fields and Kanbur's (2007) model illustrates the importance of assumptions around model parameter values in determining the overall impact of minimum wages on poverty. Although their model is highly theoretical, it is useful to explore here given that it is designed especially to evaluate the poverty effects of minimum wages. The Fields-Kanbur model is per definition an economy-wide model, but given the model assumptions (see below) it operates similarly to a partial equilibrium model.

The starting point of their model is the assumption that the minimum wage legislation applies and is enforced in all sectors of the economy equally. The model further assumes that there is a single homogenous type of labour that is supplied by workers and demanded by firms, with no labour force entry or exit. The entire population in the model participates in the labour market, i.e. everyone is either employed or unemployed. Any person who is unemployed earns zero income, except when some form of income sharing takes place where the unemployed share in the income earned by the employed. Based on the FGT approach to measuring poverty (see equation [A.1] in the Appendix), the model shows that the poverty effects of minimum wages depend on four parameters, namely (1) the degree of poverty aversion, which is represented by α in the FGT equation, (2) the wage-employment elasticity (η_L), (3) the ratio of the minimum wage to the poverty line (w_M/z), and (4) the way in which income sharing takes place in the economy.

The supply curve in their model is normalised to one and represents the entire population. Given that labour supply is static, independent of the wage and represents aggregate supply in the economy, this curve, as shown in Figure 3.3, is vertical as opposed to the standard upward-sloping or horizontal supply curves shown earlier in Figure 3.2. Labour demand is a function of the wage rate and is represented by the downward-sloping labour demand curve, D_L . Full-employment is obtained at the equilibrium wage, w_E . For a minimum wage of w_M set above the equilibrium wage, employment declines to x and there are $(1 - x)$ unemployed persons. The extent of the unemployment depends on the change in the wage as well as the wage elasticity of demand following the relationship defined in equation [3.1].

Figure 3.3: Minimum Wage Effects on Employment in a Competitive Labour Market



Source: Adapted from Fields and Kanbur (2007)

In the basic scenario with no income sharing in the economy, the impact of the minimum wage on the FGT poverty measure (P_α) depends on where the minimum wage is set relative to the poverty line, z . If the aim of the minimum wage legislation is to raise the working poor out of poverty and the minimum wage is set above the poverty line ($0 < z \leq w_M$), it means that all those who work are non-poor, while the unemployed $(1 - x)$ earn zero and are therefore poor. The extent of poverty under this scenario is shown in equation [3.6].

$$P_\alpha = \frac{1}{n} \sum_{i=1}^q \left(\frac{z - 0}{z} \right)^\alpha = q/n = 1 - x \quad [3.6]$$

This result is independent of the value of α , i.e. the poverty measure equals $1 - x$ for all values of α . Further, since the population is normalized to one, the share of unemployed is also the number of unemployed.

If, alternatively, the minimum wage is set below the poverty line ($0 < w_M < z$) the population will consist of x people who receive the minimum wage and $(1 - x)$ people who are unemployed and earn zero. Under such a scenario even the x employed people are poor since

their wage is still below the minimum wage. This means the entire population is poor, and hence $P_0 = 1$. The results are more complex for P_1 and P_2 since income is not distributed uniformly among the poor. Thus, when the wage is set below the poverty line, P_α is defined by

$$P_\alpha = (1 - x) + x \left(\frac{z - w_M}{z} \right)^\alpha \quad [3.7]$$

In essence, this result shows that there is a poverty trade-off between the working poor and non-working poor as the minimum wage is raised, with the parameters of the trade-off determined by the wage elasticity of demand. For example, when $\alpha = 1$, poverty increases if the $\eta_L > 1$ and decreases if $\eta_L < 1$.

These predicted outcomes are for a very simplistic model where the unemployed earn no income and also receive no remittance income from the employed. A more plausible scenario is one where the unemployed share in the income of employed members of society, either formally via some form of state-sanctioned unemployment insurance (social sharing model) or informally within communities or families (family sharing model).

In the social sharing model employed persons are taxed or they donate a certain share of their income to the ‘community cooking pot’ from which all the unemployed partake. The impact on the poverty headcount now depends on a variety of factors. The level of the minimum wage relative to the poverty line will determine whether only the unemployed or all people will be poor (as before). The extent of unemployment depends on the wage elasticity, and this now also determines how many employed people are left to make contributions to the community cooking pot. The tax rate payable by wage earners will also impact on poverty, either among the employed (if the resulting net wage is less than the poverty line) or the unemployed (a higher tax share means unemployment insurance payments are higher).

In the family sharing model the entire population lives in two-person households, and each household therefore has either zero, one or two employed members. The model assumes perfect income sharing within the household, i.e. household income is pooled and then shared equally between the two members. The per capita income is therefore w_M in households with two employed persons, $\frac{1}{2}w_M$ in households with one employed persons, and zero in the households with no employed persons. A further assumption is that each individual faces the exact same probability of becoming unemployed when a minimum wage is introduced. Each individual therefore has an unemployment probability of $(1 - x)$. Given normalisation of the population, this implies that there will x^2 households with two employed members, $2x(1 - x)$ households with one employed member and $(1 - x)^2$ households with no employed persons. Once again, the outcome in terms of poverty is complex. The wage elasticity will determine

how many people become unemployed: the higher the elasticity, the larger the number of households with no employed members will be. These households are always poor. The level of the minimum wage with respect to the poverty line is also important, and whether $z > w_M$ (entire population is poor), $w_M < z < \frac{1}{2}w_M$ or $\frac{1}{2}w_M < z < 0$ will further determine whether households with one or two working members are poor or not.

Labour market economists would often reject minimum wages outright, arguing that they cause unemployment, which in turn is associated with poverty and several other negative externalities. Trade unions, on the other hand, would argue that higher wages raise the incomes of the working poor, and even if minimum wage earners are not poor, higher wages may improve income sharing between the employed and the (poor) unemployed, thus ultimately reducing poverty. The Fields-Kanbur model is important in bringing across the notion that both these views of the labour market are too simplistic, and no simple answer exists. Field and Kanbur note that not only does the truth lie somewhere in between the views of labour economists and trade unions, but “*it can be characterised precisely in terms of empirically observable parameters*” (2007:146).

As a theoretical construct Fields and Kanbur’s (2007) model is very useful. However, practical application of their model is limited. A major limitation is their assumption that the entire population is part of the labour market, something that is especially unrealistic for an economy such as South Africa economy where labour force participation rates are low. This assumption of theirs rightfully makes the ratio of the minimum wage to the poverty line one of the key factors determining the poverty effect of minimum wages, but this ratio holds very little relevance in the real world for several reasons. Firstly, as is shown later in Chapter 5, a multitude of minimum wage levels apply in South Africa. Furthermore, minimum wages typically only cover certain occupation types and workers in certain sectors. In the absence of a single minimum wage covering all workers there is no single minimum wage-poverty line ratio.

Secondly, in reality, income sharing is not as straightforward as the Fields-Kanbur model suggests. Households differ in terms of size and labour force participation of household members. This means that a R1 increase in the wage of one worker has very different poverty implications for that worker and her family than a R1 increase for another worker. A third complication relates to the assumption that workers earn a single market wage. While this is analytically convenient, actual observed wage distributions tend to follow a lognormal distribution. In terms of welfare analyses of minimum wages this means that some covered workers are below the minimum wage and others above it; furthermore, some of these ‘sub-minimum wage workers’ may initially (i.e. prior to the introduction of the minimum wage) be further away from the minimum wage that applies to them than others. These workers are set

to gain relatively more from the introduction of minimum wages, provided they remain employed.

A final concern related to the one above is that since the Fields-Kanbur model does not take into account the heterogeneity of workers, all workers are assumed to have the same probability of becoming unemployed and also earn the same wage. In a sense therefore, when job losses do occur, they are randomly distributed across the population. The implication is that whether worker x or worker y loses her job, the distributional impact is the same. The reality is that workers are not homogenous, as is evidenced by the fact that wages follow a lognormal distribution. Furthermore, individual workers each face different probabilities of being employed or not given differences in ability and personal characteristics.

2.4.2. Human Capital Model

In order to deal with this diversion from what traditional neo-classical economics assume about wage distributions and employment probabilities, Card and Krueger (1995) argue that the human capital model provides a better model for understanding employment losses associated with minimum wages. This model incorporates the assumption that different workers possess different amounts of human capital, where human capital is seen as a function of schooling, experience, ability and so on. The labour market is still characterised by a single wage (w) for an “*efficiency unit of human capital*” (Card and Krueger, 1995:360-361). The transformation function in equation [3.8] below shows how the single market wage (w) is related to the observed wage (w_i) for each individual given the measured human capital of that individual (h_i).

$$w_i = h_i w \quad [3.8]$$

Under this model the distribution of wages is affected in two ways when a minimum wage is imposed. Firstly, the entire distribution shifts to the right as the market price for human capital increases from w to w' . Secondly, the distribution is truncated to the left of the minimum wage. Any individual with $h_i < w_M/w'$ will now be excluded from the market, reflecting the fact that workers whose services are worth less than the minimum wage are discharged. As noted by Card and Krueger (1995:363), the interesting aspect of this model is the predicted pattern of employment losses: those individuals whose wages are furthest away from the minimum wage are most likely to lose their jobs, while those that initially earn just below the minimum wage may see their incomes rising by enough (due to the increase in w) to remain employed.

A useful abstraction from the human capital model is the idea that workers are non-homogenous as far as their wages and employment prospects are concerned. Also, in a

minimum wage context, those individuals that are further away from the minimum wage are more likely to lose their jobs.²⁹

2.4.3. Partial Equilibrium Micro-Models

The idea that job losses are not randomly distributed is the domain of the type of micro-incidence or micro-simulation models described in Chapter 4. The aim of such models is to better understand how job losses (or employment gains in a job gain scenario) are distributed among individuals in the economy.

Hertz (2002) takes the idea of non-random job losses on board in his analysis of minimum wages for domestic workers in South Africa. His approach involves first calculating the extent of the job loss following standard neo-classical principles, i.e. equation [3.1] is applied. Thereafter he generates random numbers between 0 and 1 which serve as random unemployment ‘probabilities’, but these probabilities are then weighted by an index that indicates how far on average a minimum wage worker’s existing wage is from the minimum wage. This weighting method draws to some extent on the human capital model assumption about job loss allocations. A modification of this approach, and one that is explored in Chapter 4 and in the results chapters, is to estimate unemployment probabilities for individuals with the use of multivariate econometric employment equations, thus taking several other characteristics of individuals into account when assigning job losses or gains.

Bird and Manning (2005) also analyse the poverty effects of minimum wages in a micro-level framework, but adopt a very different approach to that of Hertz (2002). In their simulations of minimum wages in Indonesia they assume zero job losses, which they claim may not be too unrealistic in the short run. They do, however, account for the possibility that firms, in order to mitigate the effects of higher production costs, raise their prices. Their approach is to calculate the increase in the wage bill faced by firms, which then allows them to calculate the required price increase in each sector (given aggregate demand) that would finance the increased wage bill. Expenditure data in the household survey then assists in determining the welfare implications for households.

²⁹ Of course, an alternative theory about the impact of minimum wages on wage distributions is that they do not cause a spill-over effect as the human capital model suggests. Rather, sub-minimum wage workers’ wages rise to the level of the minimum wage, while firms finance these wage increases by limiting (over time) the wage increases offered to workers above the minimum wage.

3. Wage Subsidies

3.1. Theory

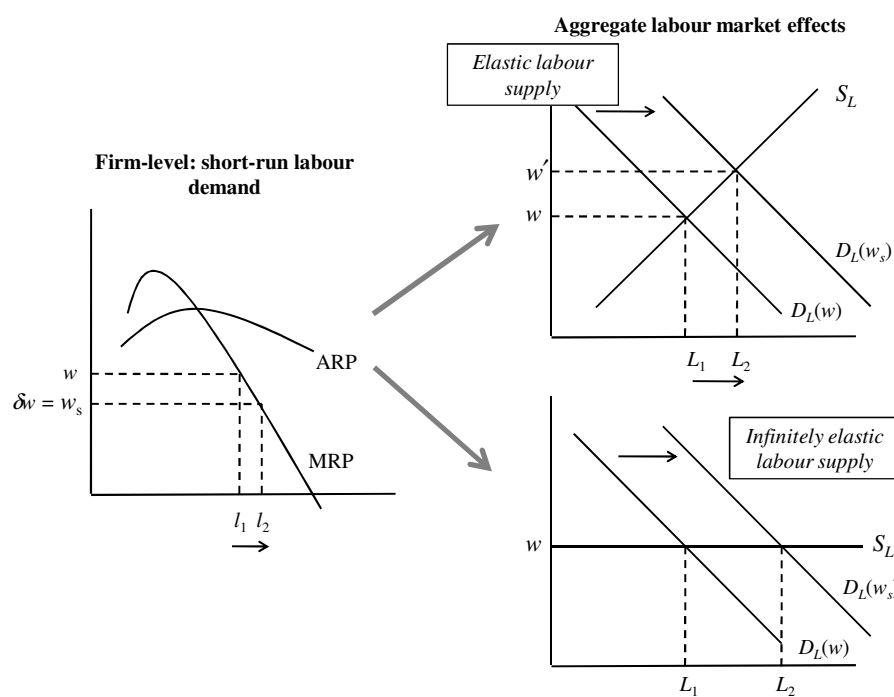
As noted in the introduction, wage subsidies are unique in that they may operate from either the supply- or demand-side. As a supply-side policy a subsidy is offered to workers, i.e. the worker's wage is supplemented directly while the firm still pays the original. Employee-side wage subsidies are prevalent in economies faced with labour shortages or where reservation wages are high. Traditionally, however, and particularly in a developing country context, wage subsidies operate from the demand-side whereby the wage faced by the employer (w_s) is subsidised by government while the employee's wage (w) remains unchanged. If the wage subsidy is expressed as a fixed share of the wage (s) then the following will hold.³⁰

$$w_s = (1-s)w = \delta w \text{ where } \delta = (1-s) \quad [3.9]$$

Economic theory suggests that a wage subsidy would act as an incentive for employers to increase employment of workers targeted by the wage subsidy policy. Figure 3.4 shows the expected employment effects graphically, first, on the left-hand side, for the individual firm. The short-run labour demand curve is represented by the downward-sloping marginal revenue product (MRP) curve, with the equilibrium employment level of the firm (defined where the wage, w , equals MRP) increasing from l_1 to l_2 as the wage drops from w to w_s as a result of the wage subsidy. At the aggregate factor market-level, horizontal summation of individual firm-level responses causes the aggregate labour demand curve (D_L) to shift to the right as shown in the right-hand panels. This causes overall employment in the targeted factor market to increase from L_1 to L_2 .

³⁰ In some instances the subsidy would be a fixed value per worker rather than a share or percentage of the wage. This does not change the analysis except that in the event of wage increases the subsidy level will automatically increase if it is expressed as a share of the wage (see discussions to follow).

Figure 3.4: Partial Equilibrium Firm and Market-Level Analysis of Wage Subsidy Effects



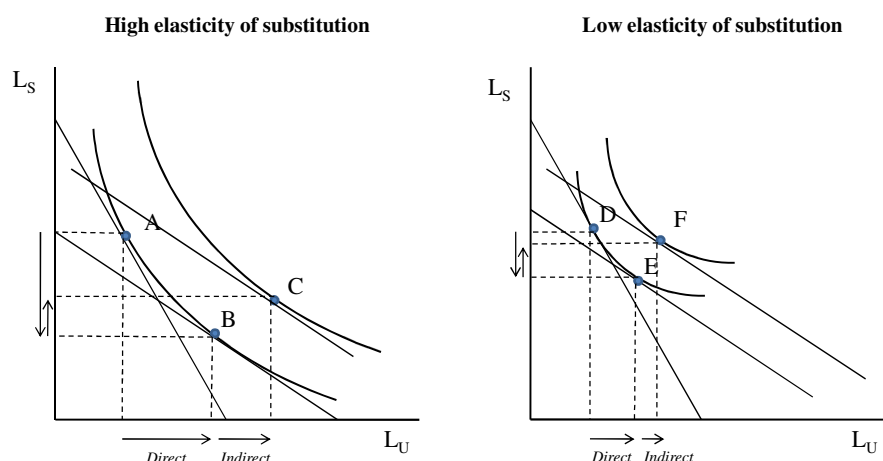
There are two possible outcomes at this aggregate market-level (see Katz, 1998). The top panel on the right-hand side of Figure 3.4 shows the outcome when the labour supply curve (S_L) slopes upwards. Under such a scenario the equilibrium wage will increase to w' , which implies that the wage subsidy is shared between the worker and the firm. Both the wage elasticities of supply and demand will influence the employment effect.³¹ Usually, however, wage subsidies in the developing country context are targeted at low-skilled workers. If they face very high rates of unemployment as is the case in South Africa, their supply curve could be thought of as infinitely elastic (or horizontal). This case is shown in the bottom panel on the right-hand side of Figure 3.4. In this instance there will be no wage effect from the policy, but the employment impact will be larger than before.

The above is still only a partial equilibrium analysis and only shows the direct employment effects for targeted workers. In reality other non-targeted factors of production employed by firms may also be affected by a wage subsidy policy. The direct effect is therefore more appropriately illustrated as a substitution effect along the production isoquant. Figure 3.5 below shows such production isoquants for a production function in two inputs, namely skilled workers (L_S) and unskilled workers (L_U) under two scenarios. The left-hand panel shows the outcome under a high elasticity scenario, while the right hand panel illustrates the low elasticity scenario (compare Figure 3.1). If the unskilled wage is subsidised, employers

³¹ Katz (1998) shows that for a demand elasticity of η and a supply elasticity of ϵ the employment effect is given by $\frac{d \ln L}{ds} = \frac{\eta \epsilon}{\eta + \epsilon}$ while the change in the wage will be $\frac{d \ln w}{ds} = \frac{\eta}{\eta + \epsilon}$.

will substitute skilled workers for unskilled workers, which is represented in the figure by movements from A to B or from D to E in the two scenarios respectively. The substitution effect will be larger the higher the elasticity of substitution. Thus, in addition to an increase in unskilled employment, skilled employment levels may be affected negatively through this substitution effect.

Figure 3.5: Direct Substitution and Indirect Employment Effects of Wage Subsidies



An indirect effect is also observable. Heintz and Bowles (1996) explain that wage subsidies lower the production costs of firms. This enables them to lower ‘commodity prices’, which in turn leads to an increase in demand for goods and services produced by the firm.³² This allows the firm to increase employment levels of all factors of production as production moves to a higher isoquant (i.e. from B to C, or from E to F).³³ As indicated in Figure 3.5, the indirect employment effects work in a positive direction for both types of labour, although this depends on the exact shape and positioning of the isoquants. If, for example, unskilled labour is thought to be an inferior input, the indirect employment effect may be negative. Also, if the shift in the isoquant is substantial, net employment changes of skilled workers may even be positive despite the initial substitution effect.

3.2. Policy Design Issues

The particular design features of a wage subsidy policy depend on a number of factors. Most important of this is the aim or intention of the programme, which in turn depends on the

³² The use of the term ‘commodity prices’ follows convention in the general equilibrium literature (see Chapter 4) to refer to goods and services (both intermediate and final) as commodities. This term is used throughout the study and should not be confused with ‘basic’ commodities such as wheat or coal.

³³ A related way of thinking about this indirect effect is in terms of firm profits and capital accumulation. Lewis (2001) refers to this as the accumulation effect of a wage subsidy. In terms of this analysis, firms may choose to raise their profit levels rather than reduce commodity prices. This enables firms to increase their production capacity levels in the long run by investing more in capital stock.

underlying nature of the labour market problems that are to be corrected by the policy. Wage subsidies can be designed with any one of three types of objectives in mind (see Aislabie, 1980). The first and most common is the aim of job creation, which is achieved either through reducing unemployment or increasing labour supply. A second objective may be employment retention, i.e. government offers a subsidy to the firm if they retain workers that would have been laid off in the absence of the subsidy. Thirdly, employment subsidies may be implemented to induce investment via the accumulation effect described earlier.

The rationale for a wage subsidy in South Africa is a reduction in unemployment. However, the effectiveness of the policy may to a large extent depend on how well such a policy is designed. The literature identifies several choices that have to be made around design of a wage subsidy (Heintz and Bowles, 1996, Katz, 1998, Lewis, 2001, and Phelps, 1994 all provide good overviews). In particular, policymakers need to decide about coverage (targeting) of the policy, its applicability, the method of disbursement of the subsidy and financing of the programme. The theoretical and practical implications of each of these are discussed briefly below.

3.2.1. Coverage

The term coverage refers to whether a subsidy is a targeted or a general one. Targeting in this context refers to the targeting of workers or economic sectors that meet certain criteria. Broad (or no) targeting may be problematic since people who would have found employment easily in the absence of the subsidy will still be employed first (Smith, 2006). In contrast, narrow targeting increases the effectiveness of a policy in reaching the intended beneficiaries. Targeting further reduces the overall subsidy cost by focusing resources on selected workers or industries. However, it comes at the expense of increased administrative and monitoring costs. Targeting of specific types of workers may also cause unintended labour substitution effects where non-targeted workers are simply replaced by targeted workers without raising overall employment levels (Aislabie, 1980).

The targeting of industries is perhaps less common. In many respects industry targeting happens implicitly through the targeting of workers that are employed in abundance in specific sectors (Smith, 2006). If industry targeting is still deemed necessary, indicators such as value added or employment structures, the capital-labour ratio, labour-output coefficients and backward and forward linkages may be useful for identifying suitable industries. In theory the sectoral wage elasticity of demand for labour will also make for a good indicator, although, given the difficulties in obtaining reliable estimates this might be a tenuous option (Pauw, 2002 considers in more detail how these criteria could be applied).

3.2.2. Applicability

A second design issue is the applicability of the subsidy. In some instances the wage subsidy only applies to additional workers employed (a marginal wage subsidy). Alternatively, it can apply to all targeted workers employed by the firm, i.e. both the existing workers that satisfy the conditions as well as new recruits. In the case of the latter firms enjoy windfall gains even if they fail to increase employment of targeted workers. Marginal subsidies, while cheaper overall, are more costly to administer as it requires detailed reporting by firms and monitoring by officials.

Effectively, a marginal subsidy is also a form of targeting. However, rather than necessarily targeting specific occupation categories (e.g., low-skilled workers), marginal subsidies target potential newcomers as opposed to incumbents or existing workers. This may also lead to unintended substitution effects, although in this instance firms may replace incumbent low-skilled workers with low-skilled targeted workers. Of course, under a general subsidy that is available to both incumbents and newcomers, this is not a concern.

The subsidy period is also of relevance here. A subsidy that is only offered for a limited period of time effectively becomes a marginal subsidy, i.e. if the firm wishes to retain a worker after the subsidy period it would have to do so at the full employment cost. Substitution effects or ‘churning’ may therefore also relate to the subsidy period. Of course, if the subsidy period were longer, the subsidised worker would have received more training and the firm may be less inclined to dismiss such a person at the end of the subsidy period.

3.2.3. Disbursement

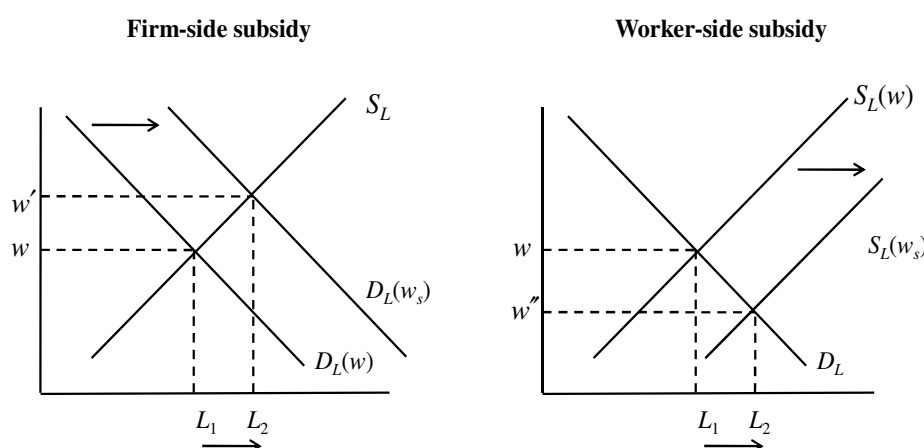
The third design choice is around payment or disbursement of the subsidy. There are three issues that need to be considered. The first is about how the subsidy value is to be calculated, i.e. it can either be calculated as a percentage of the wage or it can be a fixed payment per worker. The second concerns whether the subsidy is paid to the firm or the employee, while the third is about how the subsidy is to be disbursed, i.e. through the tax system (rebates or tax credits) or as a direct payment to firms or employees.

As far as the calculation of the wage subsidy is concerned, Heintz and Bowles (1996) argue that a wage subsidy calculated as a percentage of the wage will act as an incentive to employ high-wage workers, while a fixed subsidy will have the opposite effect. A practical solution to this problem is to calculate the subsidy as a percentage of the wage at low wage levels but capping the total subsidy amount payable per worker once a certain threshold is reached. The actual share or amount by which each worker’s wage is subsidised is a related choice that has to be made. This choice is governed by the overall wage subsidy budget, but factors such as

the coverage and the expected employment response also need to be taken into account when solving for the optimal wage subsidy value or rate.

The choice about whether the firm or employee receives the subsidy makes little difference theoretically. Figure 3.6 illustrates that both options will lead to the same employment effects (from L_1 to L_2). Whereas the left-hand panel shows the outcome under a firm-side subsidy (compare Figure 3.4), a worker-side subsidy (right-hand panel) initially raises the wage received by the worker (the firm still pays the market wage), which leads to an increase in labour supply. This will cause the equilibrium wage to decline to w'' and the subsidy is once again shared between the employer and the employee. In a scenario where the labour supply curve is perfectly elastic a worker-side subsidy will have no effect other than raising incomes of existing workers.

Figure 3.6: Firm-Side versus Worker-Side Wage Subsidies



In practice, however, worker-side subsidies have shown to be more effective in terms of raising employment levels. Smith (2006) attributes this to differences in administrative responsibilities under worker- and firm-side subsidies respectively. Worker-side subsidies are typically administered by government. In contrast, when firms are the direct beneficiaries they also incur the bulk of the administration costs.

Worker-side subsidies can either be in the form of re-employment bonuses (i.e. once-off cash bonuses that are available to unemployed persons once they find employment) or they can be direct monthly supplements to wages earned. The main reason for the implementation of worker-side wage subsidies is to increase labour supply, particularly if reservation wages deter active labour participation or if unemployment benefits are higher than an individual's expected wage. If successful, increased labour supply associated with employee-side subsidies will raise the productive capacity in the economy while it may also reduce claims against unemployment insurance schemes. As argued earlier, employee-side subsidies may

not be appropriate in a country where low employment rates relate to a lack of labour demand rather than a lack of labour supply.

Finally, in terms of financial administration, both worker-side and firm-side subsidies are typically administered via the tax system. From an administrative point of view such tax credits or rebates may be preferable as it reduces the amount of money that needs to be transferred back and forth between authorities and wage subsidy recipients. Administering a firm-side subsidy programme through the tax system does, however, imply that only formal sector firms may partake in the programme.

3.2.4. *Financing*

A final design issue concerns the financing of the subsidy. Although a large budgetary outlay may be required, Phelps (1994:58) claims that the social and economic externalities associated with wage subsidies, including *“savings in welfare outlays, unemployment benefits, crime-fighting, and the increased tax revenue flowing in [due to higher employment and output levels] might counterbalance the budget”*. Perhaps the main difficulty with this type of policy is the uncertainty around what the net subsidy cost might be; the actual employment effect is uncertain, while the extent of the positive externalities and the savings associated with them is also unknown. This makes planning and budgeting rather difficult.

As far as the specific financing options are concerned, there are a number of alternatives. One option is to restructure the budget and to use savings in other areas of government expenditure to finance a wage subsidy. Another is to finance a subsidy through a budget deficit, although this may crowd out private investments in the economy. A revenue-neutral option is to generate sufficient funding through the tax system.

There are two alternatives. The first, considered by Heintz and Bowles (1996:198) as the most appropriate, is a tax on capital stock. Such a tax, they argue, will make capital stock (as a competing input for labour) *“relatively more expensive, thus fostering labour-absorbing substitution beyond that entailed by the subsidy itself”*. The alternative is to raise any of the taxes within the existing tax system, e.g. personal or corporate income taxes or the VAT rate. The aim is to find that tax rate that would balance the budget. This is less straightforward than it seems. The financing cost is variable and depends on the effectiveness of the policy to raise employment. Thus, under a low wage elasticity scenario the financing cost will be low but the policy will be less effective and vice versa. Also, any increase in employment and value added is associated with an increase in tax revenue in any event, which means the wage subsidy cost is partly self-financed.

3.3. International Experience of Wage Subsidies and Related Programmes

Practical feasibility and appropriateness are both important considerations when making policy design decisions. From that perspective an evaluation of the international experiences with wage subsidy programmes is useful. The analysis here draws largely on a survey of the wage subsidy literature (mostly ex post case studies) by Smith (2006), unless otherwise cited. The aim is to see what seems to have worked and what seems to have been ineffectual as far as wage policy implementation and design choices are concerned.

As with most ex post evaluations of the impact of a policy measure, randomised experimental data is typically unavailable. Since wage subsidies are often implemented as one component of a broader menu of active labour market policies, several factors (including other external economic factors) may influence outcomes observed in such an ex post analysis. It is virtually impossible to separately identify the impacts of each of these factors, thus making it hard to make judgement calls about the effectiveness of these policies. Despite the limitations of such analyses, it nevertheless remains useful and necessary exercise.

As noted earlier wage subsidy programmes can be either firm-side or worker-side programmes. There are several examples of worker-side wage subsidy policies, but these are mostly used in developed countries such as the USA, UK, Belgium, Finland, Ireland, The Netherlands, New Zealand and Canada as a tool to stimulate labour supply. As explained, such a policy approach is not considered appropriate in a surplus labour context, and hence in the analyses below only examples of firm-side subsidies are considered.

3.3.1. *Standard Firm-Side Subsidies*

Standard firm-side subsidies can either be untargeted or targeted programmes. There are very few examples of untargeted programmes. The *New Jobs Tax Credit* (NJTC) programme in the USA (1977 to 1978) is one such example, but the employment effects under this scheme were limited. The programme was quickly replaced (see below), which limits the extent to which policy lessons can be drawn from this experience. The fact that the policy was not targeted at specifically designated groups (e.g. disadvantaged workers) implied that at least some of the workers hired under the auspices of the scheme would have been hired anyway, even in the absence of the policy. As noted earlier, this is considered a general limitation of broadly targeted or non-targeted wage subsidy schemes.

The NJTC programme was designed as a marginal wage subsidy. It offered a subsidy for all employment increases in excess of 2 per cent above the previous year's employment level (Katz, 1998). As with any marginal subsidy it becomes difficult to distinguish between normal or planned employment growth and employment growth that was spurred by the

subsidy. Therefore, while theoretically appealing, a marginal subsidy greatly increases the administrative complexity of the scheme. A particular design flaw of the NJTC was that the total subsidy amount per firm was capped. This meant that large employers could not benefit as much in relative terms. As discussed below, it is often large firms that participate actively in wage subsidy programmes; hence, capping their potential benefits may seriously hamper the overall effectiveness of the policy.

There are several examples of targeted firm-side wage subsidies. Northern American examples include the *Employment Tax Credit Programme* (ETCP), which was introduced in Canada in 1978. The *Targeted Jobs Tax Credit* (TJTC) in the USA (1978 to 1994) replaced the NJTC, and was itself replaced by the *Work Opportunities Tax Credit* (WOTC). This latter programme is still in existence in the USA. Once again, however, none of these programmes were as effective in terms of job creation as anticipated. Analyses reveal there are several possible reasons for this, including the fact that subsidy amounts were often considered not generous enough to compensate employers for hiring and training costs of ‘potentially risky workers’. Participating firms were typically large, suggesting that economies of scale are an important determinant for participation. This relates to the fact that smaller firms often found the administrative costs of ensuring that new hires complied with eligibility criteria prohibitive. Furthermore, firms that participated were typically those that employed targeted workers anyway. Thus, large firms that employ many subsidised low-skilled workers, such as retailers and hotel groups, are typical participants in wage subsidy programmes.

A feature of many of the European and Eastern European wage subsidy programmes is that they are (or were) administered through local employment offices, often forming part of a more elaborate employment support programme. The *New Deal* in the UK, for example, which was introduced in 1998, “contains elements of job search assistance, retraining, subsidised employment, and public employment, all guided through a local employment office to find the best choice of employment policies for each individual” (Smith, 2006:13).

A wage subsidy programme introduced in Germany after unification required jobseekers and prospective employers to register at local employment offices who then decided how to match them. Slovakia and Poland had similar programme designs. In the case of the Polish programme, research cited in Smith (2006) found that the employment prospects of workers actually worsened after participation since the labour offices often referred workers with the poorest employment prospects first in order to ease the burden on the state’s unemployment insurance system. The important policy lesson is that labour offices may play an important role in coordinating several labour market policies and matching jobseekers and employers, but they should not be prescriptive in this regard as this may further stigmatize targeted workers.

Two other Eastern European programmes that did not operate through labour offices include the wage subsidy in Hungary for long-term unemployed persons (implemented during the mid- to late 1990s) and Romania's unique programme that offers firms the unemployment benefits that the unemployed individuals would have received (implemented in 1992). Smith (2006) cites evidence from the Hungarian programme suggesting that some months after having participated in the programme (subsidies are only available for a limited time) the employment rates of subsidised workers were no different from those of unsubsidised workers. In theory, however, this is not necessarily a bad outcome, because the subsidised workers are likely those that would have started out with lower employment prospects. Research conducted on the Romanian programme suggests that little of the hiring that took place under the auspices of the scheme could be considered incremental hiring.

From these examples some further preliminary remarks can be made. Firstly, you do not necessarily expect participants in a wage subsidy programme to be better off (as far as employment prospects are concerned) than non-participants. What is important, however, is that their own employment prospects would now have improved through acquisition of some skills during the period of subsidised employment.³⁴ A second requirement of a programme is that it actually generates above-equilibrium or incremental employment. Programmes generally appear to be less effective in reaching this goal, although it remains difficult to measure given the uncertainty around the 'natural' employment growth path of firms.

3.3.2. Training-Linked Wage Subsidy Programmes

There is a strong perception that training-linked wage subsidy programmes are ideal in countries such as South Africa where the unemployment problem is closely related to a lack of experiential training and low skill levels (see Lewis, 2001). The notion that a wage subsidy programme can only really be considered successful if participants' employment prospects improve after completion of the programme presents a strong argument for linking the subsidy to some form of training provision.

As far as international examples are concerned, several of the South American wage subsidy programmes, including programmes implemented in Chile, Argentina, Peru and Uruguay (see Smith, 2006 for details), are particularly relevant from a South African perspective. These developing countries face many of the same kinds of economic challenges as South Africa, while the training-linked subsidy programmes used in these countries are quite similar to

³⁴ For example, Smith (2006) cites research that finds that the wage subsidy programme in Australia (*Jobstart* was introduced in 1985 and was targeted at long-term unemployed, homeless disabled, ex-offenders and the elderly) actually raised people's employment prospects by 30 per cent after the subsidisation period came to an end. The Polish example discussed earlier had the opposite effect.

South Africa's learnership programme.³⁵ Unfortunately the South American programmes have not been extensively evaluated, but participation rates are generally reported to be high. There is at least some evidence that participants' employment prospects improve after the completion of training.

3.3.3. *Worker-Initiated Subsidies*

Worker-initiated subsidies typically operate via a voucher system whereby targeted workers carry a voucher which can be presented to employers when they apply for work. The voucher then enables employers to claim a subsidy for employing the worker. The advantage of this system is that employers are not required to confirm the eligibility of the worker. The downside, however, is that voucher-carrying workers may be stigmatised if they are perceived by employers to be inferior. Wage subsidy policies designed in this manner, however, appear to be more effective than normal subsidies, most likely due to the fact that voucher-carrying jobseekers rate their chances of finding employment with a voucher higher than before and hence look harder. The reason why this design option is interesting from a South African perspective is that it essentially contains the same ingredients as the youth wage subsidy proposed by Levinsohn (2008) for South Africa (see Chapter 6). Also, since the programme is initiated by jobseekers it is effectively a marginal subsidy programme, although it does not suffer the same administrative drawbacks as standard firm-side marginal subsidies.

4. **Concluding Remarks**

Minimum wages and wage subsidies represent two almost opposing views of what an appropriate labour market intervention would be to reduce poverty. However, given the context of labour markets and poverty in South Africa, both policies have merit. As argued in Chapter 2, poverty in South Africa is linked both to low wages earned by the working poor and an inability among the remaining poor labour market participants to access employment. However, the success or failure of these policies in reducing poverty is likely to depend on very specific and often conflicting circumstances.

Table 3.2 summarises the features of these policy approaches based on the preceding discussions, looking in particular at the way in which the policy is implemented (the policy 'handle'), the way in which it is financed and how wage incomes and aggregate demand are affected by each. For the purpose of the discussions here and in the remainder of this study, we focus on the fifth row of the table, namely the poverty implications of each policy. Both

³⁵ Learnerships are probably more accurately described as training subsidies, but in South Africa this policy intervention also aims to raise employment. A discussion of the South African learnership experience appears in the Appendix (see section 4.2.1).

policies have uncertain poverty outcomes. In the case of minimum wages both the extent of the wage increase and, potentially, the number of jobs lost in the process are important. In the wage subsidy scenario the extent of the job gains will largely determine the poverty impact (assuming wages of incumbents and newly employed persons remain unchanged). Ultimately, though, minimum wages will be more effective when the wage elasticity is low, while wage subsidies require a high responsiveness to wage changes. For both these policy options the timeframe is important: when evaluated over a longer period it is likely that the employment response to each policy option will be larger, *ceteris paribus*.

Table 3.2: Comparison of Minimum Wages and Wage Subsidies

	Minimum wages	Firm-side wage subsidies
<i>Policy 'handle'</i>	Increase wages of targeted workers directly through legislation.	Reduce wages of targeted workers through subsidisation of wage faced by the firm, but maintaining wage level of the worker.
<i>Financing</i>	Self-financing, i.e. firms mitigate costs through price increases and employment substitution.	Financing required, typically has tax implications or budget reorientation.
<i>Wage incomes</i>	Wages of incumbents increase, but this comes at the expense of employment losses.	Wages stay unchanged, but higher employment levels translate into increased incomes in beneficiary households.
<i>Macro demand-side effects</i>	In a partial equilibrium context with inelastic labour demand, the total wage bill will increase, which causes aggregate demand and the scale of production to increase. However, a complete assessment requires consideration of both scale and price effects. Changes in the distribution of consumption are of greater interest.	Aggregate demand is likely to increase as unemployed resources are drawn into employment, thus increasing the overall production capacity in the economy. Changes in the distribution of consumption are of interest given the financing requirements.
<i>Poverty implications</i>	Uncertain: depends on (1) the extent of wage increase and job losses (effective when the wage elasticity of demand is low and job losses are minimised), (2) the distribution of job losses among poor workers, and (3) the extent of price increases associated with firms' cost mitigation strategies.	Uncertain: depends on (1) the extent of job gains (effective when wage elasticity of demand is high and job gains are maximised, even though this raises the financing required), (2) the poverty status of beneficiaries and the distribution of job gains, and (3) the negative effects of increased taxation (if financed through the tax system); these are offset by lower production costs and prices in the economy

A very important consideration is the distribution of job losses and job gains under the two policy options. This was illustrated in the earlier discussions about job loss distributions under a minimum wage policy, but the issue is equally important in the context of job gains under a wage subsidy policy. Under a minimum wage policy, if job losses are concentrated among workers that are further away from the minimum wages and more likely to be poor – and theory and evidence suggests this may well be the case – the poverty-reducing effects of the minimum wage is jeopardised. Wage subsidies will also only be effective as an anti-poverty strategy if the beneficiaries are in fact poor jobseekers, as discussed earlier in Chapter 2.

Finally, the indirect effects of both policy approaches are important to consider. In the case of minimum wages, production cost increases may be passed on to consumers. This leads to a decline in households' disposable income, and hence the overall effectiveness of the policy in reducing poverty is hampered. Wage subsidies, on the other hand, are associated with a reduction in production costs. In a perfectly competitive product market these cost savings are passed onto consumers in the form of lower commodity prices. This may have important indirect welfare and demand effects. The overall programme cost incurred by government is another important consideration. Ultimately, the cost is a function of the effectiveness of the policy in terms of creation jobs – the more jobs are created, the more workers have to be subsidised. The indirect effects of increased taxation, which ultimately impacts negatively on consumers' disposable income and welfare levels, also need to be considered in an assessment of the net welfare or poverty effects associated with the policy.

The preceding discussions are useful for starting to conceptualise what a modelling framework for ex ante labour market policy impact analyses should look like and what the important components, parameters and linkages in such a modelling framework should be. This is the central topic of discussion in Chapter 4. Chapter 5 and Chapter 6 then present results from various modelling simulations of minimum wage and wage subsidy policies.

Chapter 4. Labour Market Policy Impact Analysis: Model Design Options and Considerations

The aim of this chapter is to provide a more technical description of possible modelling approaches that could be followed to analyse the impact of labour market policies on the economy. Section 1 is a recap and a formalisation of the important linkages and parameters that should ideally be included in an ex ante labour market model, drawing on earlier points raised in Chapter 2 and Chapter 3. Section 2 continues with a discussion of two possible ex ante modelling approaches. The first is a micro-focused partial equilibrium modelling approach, while the second is an economy-wide or general equilibrium approach. Discussions in this section will concentrate on how important economic linkages and behavioural responses are captured in each of these models, and what the implications of the underlying assumptions are for the analysis of poverty and distributional effects.

The conclusion from section 2 is that neither of the two modelling approaches is truly satisfactory; hence section 3 provides a critical discussion of the possible ways in which micro- and macro-modelling approaches can be integrated or used sequentially in order to provide a better representation of the economy at both the macro and micro levels of observation. Section 4 provides an explanation of the specific modelling approaches followed to analyse labour market policy effects in this study. Section 5 draws brief conclusions.

1. Labour Market Policy Impacts: Conceptualising a Modelling Framework

Generally, ex ante policy evaluations are done by implementing policy shocks in a modelling framework that incorporates behavioural responses by economic agents or actors. Such a model further captures various linkages between actors, which allows for an evaluation of the

impact of a particular policy shock at an economy-wide level. When *building* such a model it is important to consider how these linkages between economic agents should be defined and captured in the model. A failure to incorporate all the linkages means that the full extent of the policy effect will not be captured. Model *calibration*, on the other hand, involves the process whereby values are assigned to parameters in the behavioural equations of the model. In instances where parameter values either represent shares that can be calculated directly from the underlying data or are clearly defined by economic theory, calibration is a fairly straightforward process. However, when parameters are behavioural parameters (e.g. elasticity values) that are either estimated with error or subjectively chosen by the modeller, the calibration process becomes more tenuous. It is these latter types of parameter values that will ultimately determine how agents respond to economic shocks, and hence it is important to consider carefully what values to choose.

Based on the findings in the previous chapters, but also borrowing and adapting the collective ideas of McCulloch et al. (2001)³⁶ and Fields and Kanbur (2007), we identify five important behavioural parameters and/or linkages that should ideally be included in a modelling framework used to analyse the impact of labour market policies on poverty. These are listed and discussed briefly below. This list of parameters or linkages serves as a useful checklist for evaluating the possible modelling framework discussed in section 2.

The first parameter is the responsiveness of labour demand to changes in relative factor costs. The relevant parameter is the **wage elasticity of labour demand**, or the related concept of the elasticity of substitution between several factors of production. The wage elasticity or elasticity of substitution usually enters into economic models as an exogenous model parameter. Despite the fact that this parameter is crucial in determining the extent of the employment effect in a model, this parameter is often chosen subjectively by the modeller. As discussed in Chapter 3 there is a great deal of uncertainty around what the true value of this parameter is, and hence the choice of elasticity parameter is a tenuous one.

A second important feature of ex ante models used in the context here of evaluating poverty impacts of labour market policies is the **link between households and labour market participants**. Two issues are of interest. Firstly, when employment levels change, careful thought needs to be given to the allocation of job gains or losses among individual labour market participants. Secondly, the linkages between these participants and households are important in determining the poverty and distributional results. Aggregation is a key theme in

³⁶ The handbook by McCulloch et al. (2001) focuses on trade liberalisation and poverty linkages. In short, they identify three potential pathways through which the poor are affected by trade policy. The first is through the price transmission mechanism, i.e. this linkage requires an understanding of how changes in border prices get translated into changes in prices faced by (poor) households. The second pathway is via the impact on enterprise profits, employment levels and wages. The third pathway considers changes in government revenue and the impact on its spending capacity.

this regard; some models are specified at the individual level where behaviour of or impacts on real persons (e.g. labour market participants) or households are modelled. Others operate at a representative factor or household group level and hence the labour market-household link is modelled at a more aggregated level. As the discussions in the following sections show, the level of aggregation in the model may ultimately affect poverty estimates obtained.

The third important set of parameters relate to **poverty measurement**. As illustrated by Fields and Kanbur (2007), poverty results obtained under ex ante labour market models may be sensitive to the choice of poverty line (this could be thought of as a model parameter) and to the poverty aversion parameter used in the Foster-Greer-Thorbecke class of poverty measures. In the absence of a nationally agreed upon poverty line, the choice of poverty line is a subjective one and determined by the modeller. Of course, in a comparative static context the interest lies more in the *change* in poverty; the actual *level* of the poverty line is of secondary concern. Policy impact may also have very different impacts on (say) the poverty headcount and the depth of poverty. It is important to not fall in the trap of only reporting on poverty headcounts.

The fourth set of linkage effects that should ideally be captured in a modelling framework is the behavioural responses of consumers, or more broadly, the **indirect price and demand effects** associated with policy shocks. Labour market policy shocks may lead to either price changes (this is associated with increases or decreases in production costs at the firm level) or household income levels may change in response to wage or employment variations. Both these changes impact on consumers' disposable income levels. If these changes are large enough, indirect consumption demand effects may be significant in adding to or countering some of the direct production or employment effects of the policy. Ideally, therefore, a modelling framework should capture these potentially important indirect effects.

A fifth important linkage relates to the **role of government** in the economy and in specific policies. Certain policies require substantial increases in government expenditure. While this implies an injection in the economy, it also means that additional funding needs to be raised. Often this is achieved through taxation, which in turn may have several indirect implications; for example, if personal income tax rates are increased to generate the required funding, households' disposable income levels are adversely affected. A modelling framework should therefore ideally include a government dimension.

The next section explores the different kinds of ex ante models that can be used to simulate the impacts of various labour market policies on poverty. The modelling approaches are evaluated against the list of parameters and linkages listed here and the advantages and disadvantages of each approach are highlighted. The aim is to develop a better idea of what type of model would be most suited to the analyses in this study.

2. Ex Ante Policy Evaluation: Micro- and Macro-Modelling Frameworks

2.1. Partial Equilibrium Models for Micro-Level Policy Impact Analysis

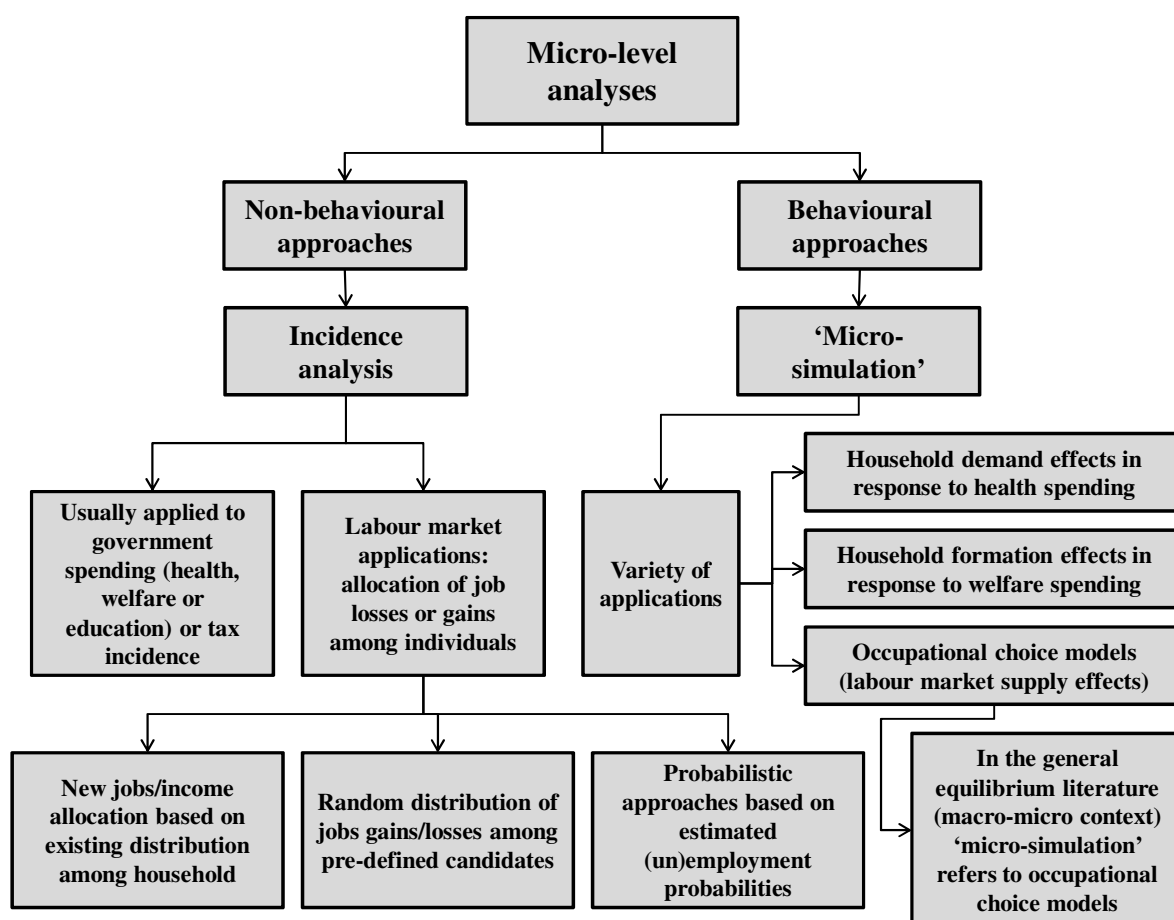
The first type of ex ante approach is a micro-level policy impact analysis approach. The term micro-level analysis refers to any evaluation of the impact of policy interventions on individual units of observation (e.g. households or individuals) in the economy. Such analyses typically utilise micro-survey data of households or the labour force, with the interest being in establishing whether a policy might have or has had any significant distributional or poverty effects.

Micro-level analyses improve on analyses conducted at a more aggregated level by explicitly identifying individual winners and losers of a policy shock. Bourguignon and Spadaro (2005:78) note that the use of micro-level analyses only really started to develop in the 1980s as large and detailed datasets on individual agents became freely available and computing power started to increase rapidly. They predict that these approaches to economic analysis are “*bound to intensify and deepen*”. However, given the amount of detail included in these models, they are largely partial equilibrium analyses that ignore many of the important interaction effects with the rest of the economy.

Micro-level analyses can be categorised into non-behavioural approaches, which are essentially accounting exercises or arithmetical models in the mould of basic incidence analyses, and behavioural approaches (Bourguignon and Pereira da Silva, 2003). Under the latter individual agents in the models are allowed to alter their behaviour in response to policy shocks. Although the term ‘micro-simulation models’ has been used to collectively refer to both behavioural and non-behavioural approaches, it is strictly speaking only the approaches that incorporate behavioural changes that can be considered true micro-simulation models. Perhaps part of the confusion around what can be called micro-simulation stems from the fact that the micro-level analyses conducted by Orcutt (1957) did not include behavioural responses of households, even though his work was referred to as micro-simulation modelling. Orcutt is nevertheless considered by many as the originator of modern micro-simulation techniques.

Figure 4.1 below provides a classification scheme for micro-level analyses that was developed in order to facilitate discussions to follow.

Figure 4.1: Classification Scheme for Micro-Level Analyses



2.1.1. Micro-Incidence Models

The non-behavioural approaches, as noted, are analyses in the mould of benefit incidence analysis techniques. Benefit incidence analysis is usually associated with the measurement of the incidence of public spending on health, welfare or education, or the incidence of tax expenditure on households (see Van der Berg, 2005 for a South Africa application). In terms of this approach, households are typically grouped into income or other relevant socio-economic groups in order to make inferences about the distributional effects of social or tax policies (Ahmed and O'Donoghue, 2008). Although benefit incidence analyses are traditionally *ex post* in nature, they can easily be applied in an *ex ante* simulation context.³⁷

Of greater interest here are the 'micro-incidence' approaches that have been applied in a labour market context. Generally, micro-incidence labour market models use pre-defined allocation rules to determine how job gains or job losses associated with a certain policy shock might be distributed among individuals. These job losses or gains may be calculated as

³⁷ For example, the distributional or poverty effects of proposed expansions of government spending could be simulated under the assumption that such spending would be distributed in a similar way as existing expenditure.

part of the micro-incidence model using standard labour market theory, i.e. the employment change at the industry or economy-wide level is estimated by multiplying the wage change by the wage elasticity of demand (see Hertz, 2002). Alternatively, job losses or gains can be derived from other studies or observed from actual employment statistics (see Pauw et al., 2007a). In such instances the micro-incidence model only serves the purpose of finding a plausible distribution of job gains or losses among individuals.

Once winners and losers have been identified, wage incomes are adjusted accordingly: the newly unemployed lose their wage income while the newly employed now earn a wage. Often wages of newly employed persons are estimated econometrically using earnings functions. If data is available that allows the linking of individual labour force participants to the households in which they reside, the wage income changes can be transferred to the household in order, firstly, to determine where in the household welfare spectrum winners and losers are located, and secondly, to determine the overall poverty and income distributional effects of the policy.

Clearly, the way in which the job allocation mechanism is designed will have important implications for the poverty and distributional effects obtained in the model. There are essentially three ways in which to model the job allocation process (see Figure 4.1 earlier). The first is to assume that job losses or gains are distributed among groups of households in the same proportions as existing employment opportunities are distributed. Under this ‘classic incidence analysis approach’ representative household groups are formed, say, on the basis of income quintiles. The initial distribution of jobs among these household groups then dictates how job gains or losses will be distributed. Of course, the use of household groups suggests aggregation of micro-data, and hence such an approach is no longer a true micro-level analysis. Such a model is therefore only suitable to show which broad groups are likely to be affected, but does not identify individual households or workers that might be affected.³⁸

A second option is to assume that job gains or losses are distributed randomly among individuals in a certain target group. In Chapter 3 reference was made to the study of Hertz (2002), which looked at the distributional effects of minimum wages and the resulting job losses among domestic workers in South Africa. In that study Hertz (2002) uses random probabilities to decide how job losses are allocated among individuals. Several options exist, e.g., job losses can be entirely random, or some method can be used to influence the chances of people to be selected. Hertz (2002), for example, weights his random probabilities by an index that indicates how far, on average, a minimum wage worker’s existing wage is from the minimum wage. Generally, though, a pure randomised approach or one where randomisation plays some role is not very appealing as it is difficult to replicate results.

³⁸ In fact, as we explain later, general equilibrium models often follow this kind of approach.

A third way of allocating job losses or gains could be called a ‘probabilistic’ approach. Under this approach the probabilities that are used to identify winners and losers are estimated using micro-econometric models rather than randomly generated probabilities. Most often multinomial logit or probit models are estimated in order to predict employment or unemployment probabilities for individual labour market participants. Employment gains and losses are then allocated according to these probabilities. An example of such an approach, applied to the area of trade-induced job losses and gains in South Africa, can be found in Pauw et al. (2007a). A variation of the random selection approach is to use predicted un/employment probabilities as weights in a random draw, but once again this makes replication of results difficult.

The important assumption in the studies by Hertz (2002) and Pauw et al. (2007a) is that there is no behavioural response from labour market participants. This means that individuals do not alter their labour market participation decisions in response to the policy shock: economically inactive people will remain inactive after an exogenously imposed economic shock and vice versa. These approaches remain accounting exercises of allocating job gains or losses among individuals and then calculating the resulting changes in per capita incomes at the household level. Furthermore, the distributional and poverty effects only account for the first-round or direct effects of the change in employment, i.e. these models are strictly partial equilibrium models that do not consider household consumption responses to changes in disposable income, nor any other indirect price, demand and employment effects. We next turn to behavioural micro-level models, which improve at least on the first limitation of micro-incidence models.

2.1.2. *Micro-Simulation Models*

Micro-level models that explicitly incorporate behaviour are generally referred to as micro-simulation models. Such models may also be applied to a variety of different situations (see Figure 4.1). Examples include the modelling of household formation responses (modelling changes in household size and structure in response to welfare grant payments), or models that determine how household consumption patterns might change in response to health or education spending. Most often micro-simulation models are used in the context of individuals’ labour supply decisions. It is this latter class of micro-simulation models that are of interest in this study.

Typically, micro-simulation labour market models use econometric models to explain labour market supply decisions and to predict behavioural changes in response to policy shocks. As with the labour market micro-incidence models, econometric equations are used to predict employment probabilities of labour market participants, as well as earnings of those that are successful in securing employment. Therefore, the only true difference between a micro-

simulation approach and the model developed by Pauw et al. (2007a) is that micro-simulation labour market models consider behavioural choices from the *start* of the decision-making process.

In short, whereas the non-behavioural variant only consider which of the *existing* labour market participants (this includes both the unemployed and employed) are likely to be affected by job gains or losses, a fully specified micro-simulation model would also allow economically inactive people and active labour market participants to reconsider their labour market participation status in response to the original policy shock. A key component of a micro-simulation labour market model, therefore, is a “*polytomic occupational allocation model where individuals are allocated to, or choose from [for example] inactivity or unemployment, wage work, and self-employment*” (Bourguignon et al., 2002:18).

In terms of the remainder of the process – the allocation of job losses or gains, the estimation of predicted earnings, and the linking of individuals and households – a micro-simulation model is very similar to the non-behavioural probabilistic models discussed earlier. Importantly, however, is the fact that predicted earnings, which are estimated as part of the income generation component of the micro-simulation model, may explicitly enter into the occupational choice model if it is set up recursively. The idea is that a policy-induced change in an individual’s (predicted) earnings may alter that person’s decision to participate in the labour market. Usually, however, some exogenous change in the average wage for a factor group enters the micro-simulation model as an initial shock, with participation behaviour then based on that initial shock. The earnings function then merely serves as a tool for estimating new participants’ wages.

2.1.3. *Limitations of Micro-Level Partial Equilibrium Analyses*

Micro-incidence and micro-simulation models are certainly useful for exploring the poverty and distributional effects associated with the changes in employment and wage earnings. The advantage of these models is that they are typically based on micro-survey data of the labour force and households. The linkages between the labour market and individuals labour market participants, as well as (in some instances) those between labour market participants and households are therefore precisely defined at the individual level rather than at a representative factor and household group level as is the case with general equilibrium model (see section 2.2). This is a useful feature that aids the analysis of poverty and distributional impacts of policies at the micro-level.

As explained, in some instances partial equilibrium labour market models are used to first to estimate employment changes associated with, say, a wage shock. Partial equilibrium models of labour demand are, however, very limited. For example, when estimating the employment

effect associated with wage changes brought about by minimum wages or wage subsidies in a partial equilibrium setting, the impact of such a policy shock on other factors of production is ignored. In reality, firms' employment decisions do not consider demand for specific factors in isolation from other factors of production; rather, relative prices (wages) of all factors of production are considered jointly to decide the optimal input mix of primary inputs (see earlier discussions in Chapter 3). A more complete model of labour demand should therefore ideally allow all factors of production to enter simultaneously into the factor demand equation.

Perhaps the greatest limitation of micro-level models is the fact that they are almost invariably partial equilibrium models (Bourguignon and Pereira da Silva, 2003). This means that indirect price and demand effects are ignored. Since labour market policies impact on household incomes (via employment and wage changes) and consumer prices (via its impact on production costs), indirect demand effects may be important. Wage changes may also have important implications for consumer prices in the economy, and hence models that essentially ignore prices (also called fixed-price models) are often inadequate.

The assumption of fixed prices may of course be relaxed. For example, in the minimum wage-poverty model developed by Bird and Manning (2005) (this model was introduced earlier in Chapter 3) it was assumed that employment levels remained fixed in response to minimum wage legislation, but that firms adjusted prices in order to finance the cost of the minimum wage. This model, however, effectively entails fixing quantities (labour demand and production quantities or consumer demand levels), which clearly shows how partial equilibrium models are unable to deal with *both* prices and quantities in the same model; invariably either one of these has to be fixed or regarded as exogenous.

A further limitation of partial equilibrium models relates to the budget implications of policies. Public finance issues are largely ignored in partial equilibrium models. Since labour market models may impact both on the level of government spending and on taxes, both of which have implications for the economy, the role of government should ideally be included in the model framework.

To conclude, the introductory section of this chapter argued that models that are developed to explore labour market-poverty linkages need to incorporate five important parameters or linkages. In terms of the first, the modelling of employment responses, partial equilibrium models can be used, but they are lacking in that they only consider demand for specific factors of production, thus ignoring cross-skill and cross-industry labour demand effects. In terms of the second (linkages between labour market participants and households) and the third dimensions (poverty measurement), micro-level models are useful and even (as we show later) superior to general equilibrium modelling approaches. However, there is always

the danger that the poverty and distributional effects observed in these models are biased because indirect effects are ignored. Thus, in terms of the fourth (indirect price and demand effects) and fifth dimensions (the role of government), these models are lacking. For these reasons it may be argued that a general equilibrium approach may be preferable, especially when there is reason to believe that both the direct and indirect effects might be significant. We next turn to a discussion of general equilibrium models.

2.2. General Equilibrium Models for Analysing Economy-Wide Effects

2.2.1. *Overview*

The two main competing types of general equilibrium models are those in the structuralist tradition and those that follow neoclassical principles (see Gibson and Van Seventer, 2000). In this study the Standard General Equilibrium (STAGE) model developed by McDonald (2006) is used. The model is a member of the class of single country standard CGE models and is a direct descendant of models devised in the late 1980s and early 1990s by Robinson et al. (1990), Kilkenny (1991) and Devarajan et al. (1994). These models are also often referred to as standard general equilibrium or computable general equilibrium (CGE) models. In the discussions of general model assumptions and closure rules here and in the Appendix (section 2.1) we refer specifically to the neoclassical variant of general equilibrium models, while specific model features mentioned are for the STAGE model used in the analyses later.

Computable general equilibrium (CGE) models have become one of the most widely used tools for development planning and policy analysis, and are endorsed by international institutions such as the World Bank, the International Food Policy Research Institute (IFPRI), and the Global Trade Analysis Project (GTAP) (Ahmed and O'Donoghue, 2008). CGE models are primarily applied in three broad areas of research, namely trade policy, tax policy and energy or environmental issues (Ahmed and O'Donoghue, 2008). The consensus is that ex ante evaluations of such macroeconomic policies are best examined in the context of a general equilibrium model that effectively captures the important economy-wide effects of such policies (Cockburn, 2006). These models are used less frequently to analyse microeconomic policies, but as is the case for macroeconomic policies, microeconomic policies may also have important indirect economy-wide effects, in which case a CGE modelling framework is appropriate also for the analysis of microeconomic policies.

The microeconomic principles upon which standard CGE models are built derive from neoclassical economic theory, with households assumed to maximise utility in their consumption decisions, while firms' employment decisions are based on a profit-maximising motive. Various macroeconomic accounting principles are also upheld, e.g. savings equal

investments, aggregate supply equals aggregate demand in product and factor markets, and the balance of payments is in equilibrium.

Consistency is further ensured in the budgets of private domestic institutions (households and incorporated business enterprises) and government by defining budget equations for each (e.g. in the case of government, revenue equals expenditure plus the budget surplus). Various flexible closure rules are defined by the modeller to ensure mathematical consistency. More importantly, closure rules assign causality in the model, i.e. they determine how equilibrium is reached in various markets.

A CGE model is typically calibrated against a Social Accounting Matrix (SAM), a consistent, economy-wide data framework that captures all the resource flows associated with economic transactions that have taken place between agents in the economy during a specified accounting period. When representative agents such as household and factor groups contained in the SAM are sufficiently disaggregated, the SAM provides a very useful data source that links resource flows at the macro-level with agents at a more disaggregated level, all within a consistent framework.

Further details of social accounting and general equilibrium modelling are provided in the Appendix (section 2.1). This section in the Appendix also provides information about alternative model closure rules that can be adopted in CGE models. Given the context of this study we briefly discuss the factor market closures in the following section, before considering several of the model linkages in CGE models that are relevant to this study (section 2.2.3).

2.2.2. *Labour Market Model Closures*

Although standard CGE models are “*Walrasian and neoclassical in [their] truest form*” (Robinson, 1989:894), it is possible to incorporate certain structural rigidities to provide a more realistic representation of the economy. This is especially true for the labour market closure options. Thus, while neoclassical models traditionally assume full employment at flexible wages, it is also possible to ‘model’ unemployment by assuming infinitely elastic supply at fixed wages (see Figure 3.2 earlier). Given the centrality of the labour market in this study it is appropriate to introduce some of the labour market closure options in the standard CGE models. This section also makes some proposals as to which labour market closures are appropriate in the context of the South African labour market.

Generally, in South African CGE applications, skilled workers are assumed to suffer no unemployment, and hence a suitable labour market closure for this group of workers is the ‘full employment closure’. In standard neoclassical tradition skilled wages are therefore

assumed to be flexible (i.e. specified as variables in the model), which means wages adjust to ensure full employment at a national level. Generally workers are also assumed to be mobile across sectors, i.e. under a full employment closure those workers that are released from declining sectors will be re-employed in growing sectors in order to maintain the economy-wide employment level. This is also the assumption in this study.

Low-skilled (semi- and unskilled) workers represent those workers that are characterised as being more prone to unemployment. In terms of the ‘unemployment closure’ typically selected for this class of labour, low-skilled wages are fixed (parameters), signifying the fact that there is excess capacity (as represented by an infinitely elastic labour supply curve) among these workers.

The crucial assumption accompanying the unemployment closure rule is that there are always more workers willing to be employed at prevailing (fixed) wages,³⁹ which in the South African case seems realistic given the high unemployment rate among labour market participants with very low levels of skills. For occupations that require higher levels of skills the assumption of excess supply may of course no longer be valid (see earlier discussions around the structural nature of unemployment in South Africa in Chapter 2), which is why this closure strictly applies to low-skilled workers. The implication of an unemployment closure is that the overall economy-wide employment level (of low-skilled workers in this instance) is flexible. As is the case for skilled workers under the full employment closure, low-skilled workers are also mobile between sectors.

In the discussions to follow any reference to skilled workers assumes flexible wages and full employment conditions, while low-skilled workers are those that suffer unemployment and for whom employment levels are flexible at fixed wages.

2.2.3. CGE Model Linkages

We next consider whether a CGE modelling framework improves on a micro-level modelling framework in terms of the five parameters and linkages identified earlier in this chapter. Figure 4.2 is used as a basis for the discussions. This diagram, which shows linkages between factor market, households and government in price and quantity dimensions, is based on the modelling framework of the STAGE model in particular, although most standard CGE models follow a similar structure. The diagram clearly highlights the five parameters or linkages.

³⁹ A useful feature of this closure is that low-skilled wages can be adjusted exogenously as part of a policy shock. This is particularly relevant in the minimum wage scenarios where wages are changed directly as opposed to via a subsidy. This also implies that all workers that are affected by minimum wages have to be included in this low-skilled group facing an unemployment closure (see further discussions in Chapter 5).

We start the discussion with a consideration of how labour markets are modelled in the STAGE model. The production structure is shown in both price terms (left-hand side) and quantity terms (right-hand side) in Figure 4.2. The line labelled ①, which illustrates the interplay between prices (wages) and quantities (employment levels) in the employment decision of firms, is of relevance. As far as the quantity-side of the production structure is concerned, it can be noted that activity output (QX_a) is a nested function where, at the top level, value added (QVA_a) and aggregate intermediate inputs ($QINT_a$) are aggregated with the use of a CES or Leontief production function (see further details in the Appendix, section 2.1.2). Value added, in turn, is a CES aggregation function of primary inputs, QF_1 to QF_m , while $QINTD_1$ to $QINTD_n$ represent the quantities of intermediate inputs used in fixed proportions (Leontief function) to the level of $QINT_a$ in the production process of activity a .

The value added function is of particular importance, as it represents the factor demand component of the CGE model. Given the choice of functional form (CES), it is clear that demand for a particular factor of production is modelled here as a substitution effect between two or more factors of production rather than a movement along a particular factor demand curve as would be the case in a simple partial equilibrium framework.

The price structure in the production system mirrors the nested structure assumed for quantities. In this instance the primary building blocks on the value added side are the costs of factors of production, represented by W_1 to W_m for m types of factors of production that can be employed in an industry. The actual substitution that takes place along the value added function will depend on movements in relative factor costs. Clearly this is more comprehensive framework for simulating factor demand responses than a simplistic partial equilibrium model.

The lines labelled ② in Figure 4.2 show the links between wage earnings and household incomes (YH). Since the wage bill for factor k , the product of W_k and QF_k , also represents total factor earnings of factor group k , any change in W_k or QF_k will cause total factor earnings to change. This, in turn, will impact on the incomes of the owners of factors of production, which, in the case of labour factors, includes households. The link between factors and households, however, is only specified at the representative factor and household group level as opposed to the individual level as was the case for micro-level models. This, as illustrated in more detail in section 2.2.4, is an important drawback of the standard CGE model.

Changes in household income (YH) cause household disposable income levels ($HEXP$) to change. This measure is important for two reasons. Firstly, it serves as a measure of welfare and can be used to assess poverty changes (see ③ in Figure 4.2). Disposable income is shown

here as gross income net of income taxes (ty)⁴⁰ and savings, and can be directly linked to the level of consumption demand by households (QCD). From a poverty measurement perspective, a particular advantage of CGE models is that prices are explicitly modelled. This means that disposable income levels can be expressed in real terms, which is an important value addition (price relationships are discussed in more detail below). Once again, however, the disadvantage is that real disposable income changes are only known at the representative household group level, which limits the extent to which poverty impacts can be accurately assessed.

$HEXP$, in conjunction with relative prices changes (PQD), is important for a second reason. Wage-based labour market policies, as argued previously, cause changes in household incomes and relative prices. Households are assumed to choose the bundles of commodities so as to maximise utility, where the utility function is a Stone-Geary function that allows for subsistence consumption expenditures. This is arguably a realistic assumption when there are substantial numbers of very poor consumers. In the Stone-Geary function, household income and price elasticities are defined separately for each commodity and for each household group. Since wage-based labour market policies target specific labour groups, households gain or lose out depending on the linkages between household groups and the labour groups. These policies furthermore only target certain industries, which imply that only certain commodity prices are directly affected. Household spending patterns will therefore determine how different households are affected by relative price changes. The fact that the model is specified over multiple households, labour groups, production activities and their related commodity prices is therefore extremely useful for understanding precisely how policies impact on overall demand in the economy.

More detail about the consumption demand structure in the CGE model is included in the Appendix (section 2.1.2). Clearly, though, the size of the income and price elasticities assumed (these are applied exogenously) will have important implications for the nature and extent of the indirect effects observed in the model. These elasticities are obtained from PROVIDE (2005). Given the focus on wage elasticities and their impact on modelled outcomes, the CGE scenarios discussed in the results chapters do not consider outcomes under different price and income elasticity levels.

The price structure in the production system mirrors the quantity structure. Prices of factors of production (or wages, W_k) form a core component of the production structure in the model. Where relevant, factor use taxes (tf) may be added to the cost of primary inputs. These costs

⁴⁰ All taxes are expressed as ad valorem taxes in the model. During calibration tax rates are simply set to zero if the relevant tax instrument is not in use or applicable to a certain sector, commodity, factor or household group.

are combined with a CES aggregation function to produce the price of value added (PVA_a), a measure that provides an indication of the average cost of primary inputs. This cost is producer- or activity-specific, hence the subscript a . The price of intermediate inputs ($PINT_a$) for each producer is dependent on the prices of commodity inputs used in fixed proportions in the production process (PQD_1 to PQD_n for n commodity types supplied in the economy).

Next, intermediate and primary input costs are combined in either a CES or Leontief function to form PX_a , the activity price or average production cost of a producer. Where relevant, producer taxes (tx) are added, and these producer costs are then translated into producer or supplier prices of commodities (PXC_c).⁴¹

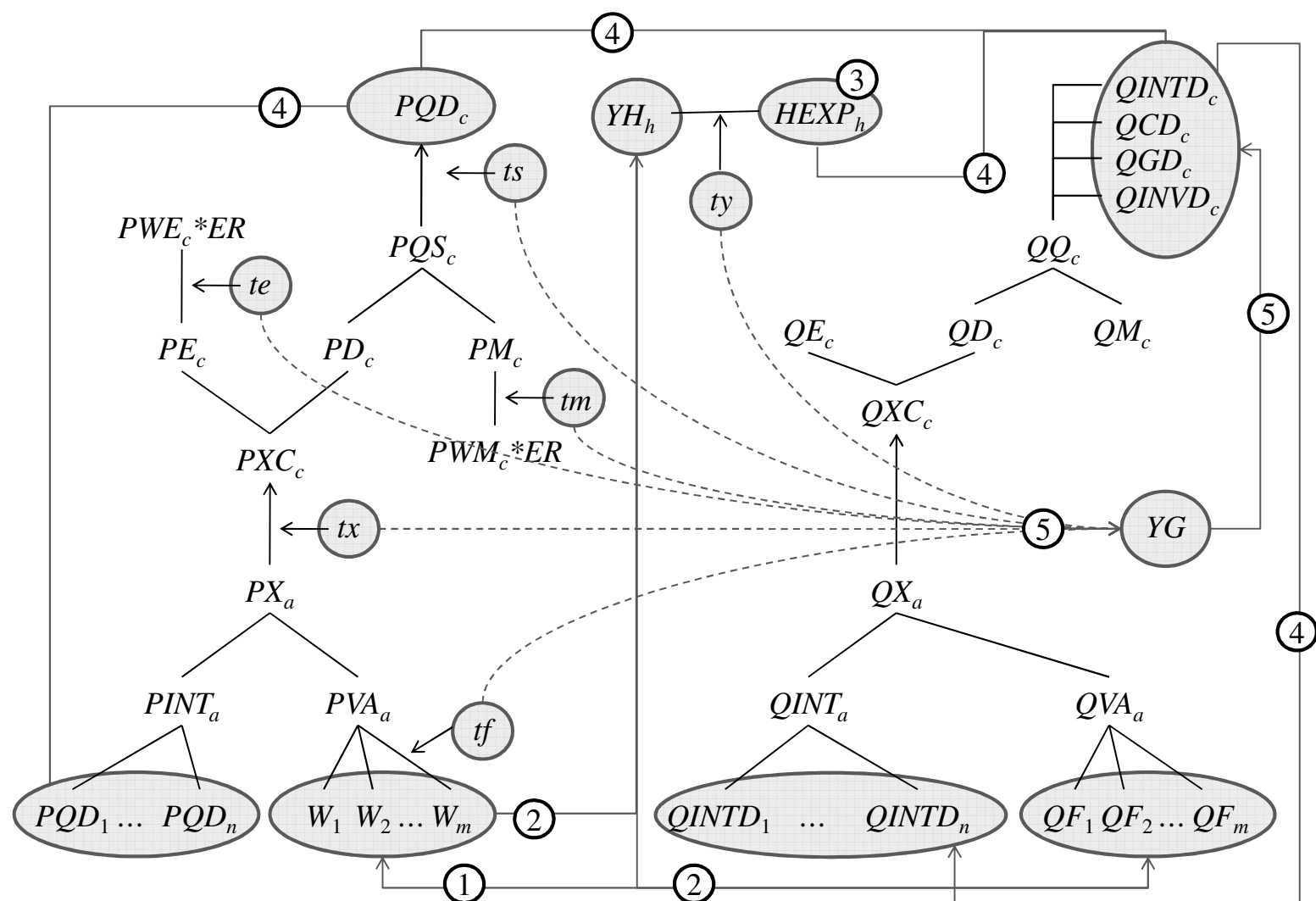
Domestic supplier prices are defined as the weighted averages of the prices received for domestically produced commodities sold domestically (PD_c) and exported (PE_c). This export price is equal to the world price of exports (PWE_c) in a foreign currency, multiplied by the exchange rate (ER) and is inclusive of any export taxes that may be levied by government (te). PQS_c represents the supply price of a so-called ‘composite commodity’ of imported and domestically supplied goods, where the price of imported goods (PM_c) depends on the world price of imports (PWM_c) multiplied by the exchange rate and increased by an ad valorem import duty (tm). Finally, commodity taxes are added (ts)⁴² to yield domestic consumer prices (PQD_c).

The important deduction from this brief discussion of the price relationships in the CGE model is that any exogenous increase (say) in the wage of a group of workers will directly lead to an increase in PVA_a and hence PX_a . Ultimately such production cost increases will raise domestic consumer prices (PQD_c). The fact that the price implications of wage-based policies are taken into account in a CGE model allows for a better evaluation of the poverty effects of these policies, but also of the indirect demand-side effects, thus improving significantly on a fixed-price partial equilibrium model.

⁴¹ In reality this ‘transformation’ is more complex. The CGE model allows for multi-product industries, i.e. each industry, in theory, may produce many different kinds of commodities. The producer prices of commodities is therefore in reality an aggregation of the activity prices of several activities that produce a given commodity (see PROVIDE, 2005 for details). The same also holds true on the quantity side.

⁴² The tax parameter, ts , in this instance represents all commodity taxes, including sales taxes, fuel taxes and excise duties. In the CGE model these tax measures enter into the model as separate model parameters that are set during the calibration process.

Figure 4.2: Labour Markets, Prices, Quantities, Household Income Relationships and Government in a CGE Model



Prices and quantities	W_k / QF_k	Wages and factor quantities
	PVA_a / QVA_a	Price/quantity value added
	$PINT_a / QINT_a$	Price/quantity intermediate inputs
	$PQD_c / QINTD_c$ $/ QCD_c /$ $QGD_c /$ $QINVD_c$	Commodity prices/quantities of intermediate inputs, household consumption, government consumption and investment
	PX_a / QX_a	Production cost/activity output
	PXC_c / QXC_c	Transformation of producer prices/quantities to commodity prices/quantities
	PD_c / QD_c	Price/quantity domestic supply demanded domestically
	PE_c / PWE_c $/ QE_c$	Domestic/world export price/quantities
	PM_c / PWM_c $/ QM_c$	Domestic/world import price/quantity
	ER	Exchange rate
Institutional income	$YH_h / HEXP_h$	Household income/disposable income (expenditure)
	YG	Government revenue
Taxes	tf / tx	Factor and producer taxes
	tm / te	Trade tariffs and taxes
	ts	Sales taxes
	ty	Income taxes

Source: Adapted from PROVIDE (2005)

As shown by the lines labelled ④ in Figure 4.2, a change commodity prices not only affects the price of intermediate inputs ($PINT_a$) and hence producer prices (PX_a) (capturing of inter-industry linkages), but it also impacts on final commodity demand. In particular, changes in prices cause real households disposable income levels ($HEXP$) to change, which leads to changes in household consumption levels (QCD_c). In demand-driven models, changes in consumption will impact directly on production and employment levels in the economy.

This brings us to the linkages between activity output (QX_a) and commodity supply in the economy, or more broadly, the quantity relationships in the CGE model. Once activity outputs (QX_a) are transformed into domestic commodity production (QXC_c) (this transformation is similar to the related price transformation; see footnote 41), domestic commodity production can be delivered to either the export market (QE_c) or the domestic market (QD_c). The optimal output mix is determined by an output transformation function with a constant elasticity of transformation (CET function). Imperfect substitutability is also assumed in the formation of a ‘composite commodity’ of domestic supply (QQ_s), which is a CES aggregation of domestically supplied (QD_c) and imported goods (QM_c) (following Armington, 1969). In both the CES and CET trade functions the relative prices of imports/exports (PM_c or PE_c) and domestically produced goods (PD_c) determine the optimal commodity mix.

In demand-driven models total domestic supply (QQ_c) has to satisfy intermediate input demand ($QINTD_c$) and final commodity demand in the economy. The latter is the sum of household (QCD_c) government (QGD_c) and investment demand ($QINVD_c$). Any change in consumption demand is met by a change in supply, either through changes in the level of imported goods or domestically produced goods supplied to the local market.

Ultimately, therefore, domestic producers are likely to respond to demand changes by altering their production levels (QX_a). This in turn leads to changes in employment (QF_k) or wage levels (W_k) in the economy. Under a wage-based labour market policy experiment any such secondary employment shock can now be considered ‘indirect’ as opposed to the initial direct employment effect caused by the wage change.

The lines labelled ⑤ show the links between the various tax parameters and government revenue (YG), which in turn is linked to government consumption expenditure (QGD_c). Any changes in production, exports, imports and household incomes will impact on government revenue and hence the government budget. These impacts are explicitly captured in the model. More importantly, though, and specifically in the context of a wage subsidy programme, is the government financing aspect that can be captured in a CGE model. For example, in the wage subsidy modelling scenarios explored in Chapter 6, two financing

options are explored, namely raising capital taxes (tf) or income taxes (ty). From Figure 4.2 it is clear to see where these taxes enter into the model and what impacts they may have on production costs and household disposable income levels respectively.

The preceding discussion has shown how a CGE modelling framework improves on a partial equilibrium model in terms of the modelling of labour demand. CGE models also explicitly capture economy-wide effects through careful consideration of how prices and indirect demand effects might contribute or detract from direct policy effects. It was further pointed out that CGE models explicitly model linkages between individual factors and households. This allows for a consideration of how labour market policy shocks might affect household incomes and poverty. All five model parameters and linkages considered important in the context of the analysis of poverty effects of labour market policy shocks are therefore incorporated in these models.

However, as explained briefly above, poverty and distributional effects are only observed at a representative household group level as opposed to at an individual level as is the case under a micro-modelling approach. The issue at hand is that household income data in CGE models are only available at the representative household group level (as specified in the underlying SAM). The functional distribution matrix, which shows the distribution of factor incomes to households, is also only specified at such an aggregated level (a schematic representation of a SAM is found in Appendix Table 2). This has important implications for poverty analyses; hence the issue deserves closer inspection.

2.2.4. *A Closer Look at Labour Market-Household Linkages and Poverty Analysis*

Aggregation and the use of representative factors and households in CGE modelling has drawn much criticism (see Laitner et al., 2000 for a thorough discussion). In neoclassical microeconomics, agents are assumed to always act in a rational manner, responding to price signals and always striving to maximise either utility (households) or profits (firms). Agents further have perfect information about prices of alternatives and the actions of other agents, including competitors. The implication is that markets always clear and equilibrium is always reached. In reality such rationality is said to be ‘bounded’ given imperfect information and the fact that economic agents do not always choose the utility-maximising alternative. The strict assumption of rationality of individual economic agents extends to representative groups in the CGE model, i.e. individual members of a representative firm or household group are joined together in the assumption that they will act in the exact same manner when responding to price signals. This joint behaviour has been termed ‘collective rationality’.

Despite the limitation of an assumption of collective rationality, aggregation is unfortunately a practical necessity. It would simply be impossible to construct a fully disaggregated

individual-level SAM – neither do we have such data, nor would it be feasible to balance such a large SAM. Each SAM account, therefore, is made up of combined information on individual firms, factors of production or households as captured in underlying surveys of manufacturing, labour markets or households. While care obviously has to be taken to group individual firms, workers or households that are similar, individual members of groups still exhibit different preferences and behavioural patterns. There is no real justification for an assumption that the aggregate of several individuals acts like a single optimising agent; put simply, “*individual optimisation does not necessarily generate collective rationality*” (see Cogneau and Robilliard, 2000:7-8).

The use of representative groups, and particular household and factor groups, has important implications for the analyses of labour market policies and their impact on poverty. Firstly, with regards to household income distributions and poverty analyses, the assumption of homogenous behaviour within representative groups in a CGE model implies that any simulated income gain or loss accruing to a certain group is shared equally among all the individual members of that group. For household groups, if the modeller only knows the total and average income of the household group without any knowledge of the underlying income distribution, the analysis of household poverty would be tantamount to determining whether the poverty status of the group as a whole remains unchanged or stays the same in response to the simulated policy shock. In reality, however, different members might have been affected differently, while heterogeneity within the group also implies that not every member is equally far removed from the poverty line.

A second limitation of CGE models is the way in which the factor market-household linkages are modelled. Whereas micro-level models allows for these linkages to be drawn at the individual unit of observation in the survey data, the use of representative groups necessitates that these links are specified at a group level. The relevant sub-matrix in the SAM, the functional distribution matrix, shows how the factor income from various factor groups is distributed among the various household groups, the ‘owners’ of these factors of production. CGE models assume that any factor income gains or losses arising from a simulated policy shock will be distributed among household groups in the same proportion as which factor income is distributed in the base data (i.e. as determined by the functional distribution matrix). By extension, any employment gains or losses are implicitly⁴³ distributed following the factor endowments in the base, which stands in contrast to the much more nuanced approaches that are permitted by micro-models.

⁴³ This allocation is said to be implicit since there are no direct links in the model between actual factor endowments (employment levels) and households. The link is via total factor remuneration, but in an unemployment closure where employment levels are flexible and wages are fixed, changes in factor incomes are directly proportional to changes in factor endowments at the household level.

The above two issues are revisited in section 3 as we seek possible solutions to these model limitations. The conclusion from the above discussion is that CGE models as a tool for poverty and distributional analyses improve on micro-level analyses in that they capture indirect effects of policy shocks. However, they also suffer from a ‘loss in specificity’, or an ‘averaging out’ of income changes at the representative household group level. Whereas in reality a wage-based policy may cause individual members of representative household groups to gain and others to lose out, the CGE model will assume that each member is affected in the same *average* way. Gains and losses within household groups potentially cancel each other out, which ultimately implies that the poverty results emanating from a CGE analysis are muted or understated. The challenge therefore is to improve the way in which the micro-dimension of CGE models is captured.

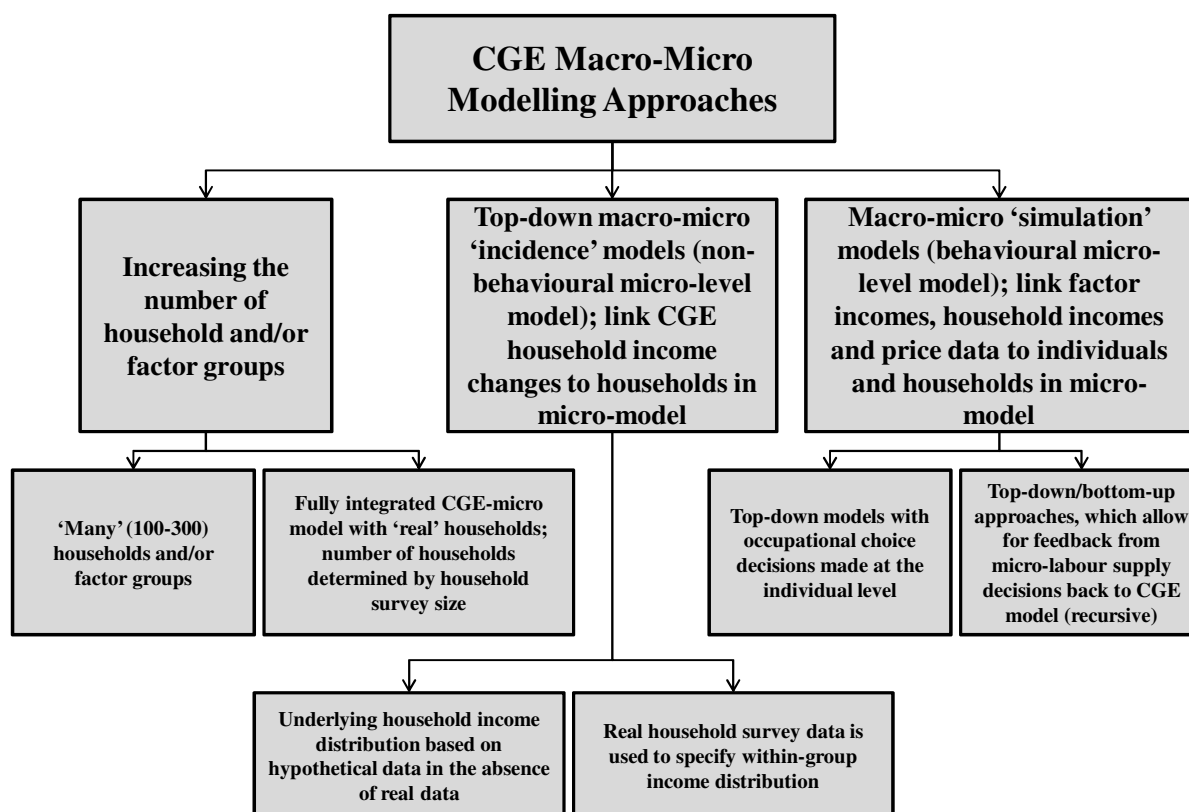
3. Improving the Micro-Dimension of CGE Models

Broadly speaking, there are three possible ways in which to improve the micro-dimension of CGE models. The first is to simply increase the number of representative household and/or factor groups contained in the SAM in order to allow for a more accurate evaluation of distributional changes. As more and more household groups are included the analysis of poverty and distributional effects becomes more nuanced. This is easily illustrated by means of statistical decomposition techniques, as shown later.

The two remaining macro-micro modelling approaches that will be discussed in this section both involve linking CGE models and micro-level models sequentially. This means the macroeconomic effects are first analysed in a CGE model, and then the micro-level impacts of these macro-level effects are analysed in a micro-framework by linking key price, wage and income results from the CGE model with the micro-level model. The first such approach is a non-behavioural micro-incidence model where real changes in representative household group incomes as predicted in the CGE model are linked to the relevant individual households in a top-down fashion.

The second is to link CGE results with a behavioural micro-simulation model. In particular, such a modelling approach allows for changes in the labour supply decisions of individuals in response to the economic shock modelled in the CGE model. Some modellers have also attempted to ‘close the system’ by linking micro-level effects back up to the macro-level in a top-down-bottom-up iterative model. The macro-micro modelling options are summarised in Figure 4.3 below, while a more detailed discussion follows in sections 3.1 to 3.3.

Figure 4.3: Taxonomy of CGE Macro-Micro Modelling Approaches



3.1. CGE Models with Many Representative Household and/or Factor Accounts

The first macro-micro modelling approach is to simply increase the number of representative household and/or factor groups in the CGE model, provided that data is available to develop the underlying SAM. As discussed in the section 2.2.4, a crucial CGE modelling assumption associated with the use of representative agents is that these agents act as single, optimising entities. The implication is that each individual or household that forms part of a broader factor or household group in the model is assumed to follow the behaviour of the group. By extension each member of a group is also affected in the same way by a policy shock. In the context of representative household groups this assumptions implies that distributional changes in the broader economy can only be caused by changes in between-group income distributions, since within-group distributions are assumed to be unaffected by a policy shock.

Three issues are of interest. Firstly, it is necessary to consider how household or factor groups should be formed given the assumption that within-group income distributions stay unchanged. The second issue relates to the contribution of between-group variance (or inequality) to overall variance, and the implications of increasing the number of groups. The

third is the question around how far we can go in terms of disaggregating household or factor groups before the SAM becomes unwieldy? These issues are discussed in the sub-sections below.

3.1.1. *Household and Factor Group Categorisation: A Theoretical Perspective*

Given the limitations of the representative household group approach to CGE modelling it is crucial to consider carefully how these groups are actually formed in the SAM.⁴⁴ Careful categorisation of household groups will, to some extent, validate the assumptions that all members of a particular group are affected in a similar way by a policy shock if it can be ensured that members of a group are as homogenous as possible.

SAM building and household group formation has a long history. Two of the first CGE models developed to explore distributional impacts of macroeconomic policies included the models by Adelman and Robinson (1978) for Korea and Lysy and Taylor (1980) for Brazil. These models produced very different results. Initially this was ascribed to structural differences between the economies of Korea and Brazil, but in a subsequent study Adelman and Robinson (1988) found that differences were due to different ‘definitions of income distribution’ in these models caused by the way in which household groups were formed. The household groups in the Korea model followed a neo-classical approach, which traditionally focuses on the ‘size distribution’ of income⁴⁵, while the Brazil model originated from within a Marxian tradition where classes in society are characterised by their factor endowments (a ‘functional classification’).

Cogneau and Robilliard (2000:7) explain that this earlier insight has led modern-day CGE modellers to adopt an “*extended functional classification*”, which takes into account several criteria for forming household groups. Although there are no hard and fast rules, there are various guidelines and requirements that have to be met when forming representative household groups (see Decaluwé et al., 1999). Firstly, the classification should correctly reproduce the socio-economic stratification within the society and the economy. Secondly, relatively homogenous categories have to be formed, i.e. the members of representative groups should be similar to one another in terms of how they are expected to react to or be affected by economic shocks. Thirdly, the groups should be composed of socio-economic groups that are recognisable for policy purposes. This may be especially important when implementing policy shocks and interpreting results. Finally, the representative groups should

⁴⁴ Note the terms household group ‘categorisation’ and ‘formation’ are used interchangeably in the CGE literature. Household formation in this context refers only to how we use data to construct groups with certain similarities, and not the theory of how individuals in the real world combine to form households.

⁴⁵ This is essentially an individualistic approach whereby the typology of households is based simply on household income levels.

be based on comparatively stable characteristics that are reliable and easily measured using existing data sources.⁴⁶

Given the above requirements, it should be clear to see why a size distribution approach to household group formation yields unreliable results. A particular low-income group can quite possibly include a household head classified as a landless agricultural worker and an urban informal sector worker. Policies are likely to have very different implications for each of these households (Decaluwé et al., 1999). Yet, when grouped together in a single representative household, the model would assume they are affected similarly. However, given policymakers' interest in the effects of policy on poverty or household incomes at different points in the income distribution, it is certainly convenient to have some income dimension in the household group structure of a SAM, or at least a distinction between poor and non-poor households. It is important, however, that income is not the only criteria around which household groups are formed.⁴⁷

The realisation that the way in which representative household groups are formed is important has meant that household group classification systems have enjoyed much attention. It could equally be argued that factor groups (labour groups in particular) should enjoy as much attention given the importance of wages as an income source of households and the fact that the functional distribution of income is a key in determining the overall distribution in the economy. It also follows that the increased detail afforded by an increase in the number of representative household and factor groups improves the overall capturing of income and expenditure flows associated with households. In fact, the same can be said for virtually any of the other representative accounts in SAMs. Löfgren et al. (2003:4) argue that for a SAM to truly support analyses of poverty and inequality it must include "*a detailed disaggregation of households and the factors, activities and commodities that are important in their income generation and consumption*". This brings us to the theoretical question

⁴⁶ In an ideal world a unique SAM would be compiled for every policy experiment conducted. However, given that SAM building is time-consuming and costly, household and factor groups are often fairly generic (see Pauw, 2005b for a survey of household classifications used in Southern African SAMs). Household groups, for example, are often based on a combination of household characteristics, such as household poverty status or income groups, location (rural or urban), asset ownership (land or capital), or various characteristics of the head of the household (employment status, industry of employment, educational attainment, gender, race and so on). Representative factor groups, on the other hand, are often based on occupation types, skills levels or educational attainment of labour market participants. Detail about how household and factor groups are formed in the South African PROVIDE SAM is included in the Appendix (section 3.2).

⁴⁷ Despite its limitations, income is often still the only distinguishable dimension in SAM household groups. For example, one of the prominent SAMs in South Africa, developed by Thurlow and Van Seventer (2002:42), only disaggregates households on the basis of income deciles. The authors admit though that this simple disaggregation is perhaps insufficient as "*policy makers are often interested in a richer household picture*".

around how poverty and income distribution modelling can actually be improved through increased disaggregation of household accounts.

3.1.2. Increasing the Number of Households: Distributional Implications

Traditionally SAMs have included only a limited number of household accounts. The level of disaggregation was typically suited to the research question being asked. Since most CGE applications focused on trade and sectoral issues, little attention was given to the household account disaggregation. However, as analysts have become more concerned with the poverty and distributional effects of policies, the limitations of models with small numbers of household accounts became clear, with the most obvious limitation being that heterogeneity within aggregated household types was not properly accounted for in models with very few representative household groups (Davis, 2003).

The fact that within-group variance adds significantly to the overall variance of a distribution is widely offered as a criticism of the representative household group approach in the CGE literature. Standard analysis of variance (ANOVA) techniques can be used to calculate the contributions of within-group and between-group variance to overall variance of a stochastic variable that is specified across a number of sub-groups.⁴⁸ In terms of this analysis the ‘sum of squares’ is the numerator in the calculation of the sample variance of the stochastic variable, or simply the variance multiplied by the population size. The between- and within-group sum of squares (*SSB* and *SSW*) of a distribution can then formally be specified as:

$$\begin{aligned} SSB &= \sum_{g=1}^G n_g (\bar{x}_g - \bar{x})^2 \\ SSW &= \sum_{g=1}^G \sum_{i=1}^{n_g} (x_{ig} - \bar{x}_g)^2 \end{aligned} \quad [4.1]$$

In this formulation the variable x_{ig} is defined over G groups in the population ($g = 1, \dots, G$), where each group contains n_g observations. The terms \bar{x}_g and \bar{x} represent the group means and overall or ‘grand’ means respectively. These two components combined make up the total sum of squares of a stochastic variable, i.e. the overall variance multiplied by the population size:

$$SST = SSB + SSW = \sum_{g=1}^G \sum_{i=1}^{n_g} (x_{ig} - \bar{x})^2 \quad [4.2]$$

⁴⁸ ANOVA techniques are usually used in the context of testing the ‘goodness of fit’ of an econometric model, i.e. it is a way to test how well a regression model (‘within-group variation’) explains overall variation, where overall variation is the sum of the variation explain by the model plus the sum of the variation of the error term or residual (‘between-group variation’).

Applied to the context of representative household groups and within- and between group variance, it should be evident that the more groups are formed, the more ‘homogenous’ members of a particular household group become, provided household formation is done in a consistent and sensible manner (i.e. by forming increasingly smaller and smaller groupings with more homogeneous households). Therefore, even if income is not explicitly a dimension along which household groups are formed, the within-group variation, represented in this instance by *SSW*, can be expected to decline with an increase in the number of households.

This hypothesis can be tested by considering different aggregations of the household groups in the South African PROVIDE SAM used in this study. There are 162 representative household groups in the fully disaggregated SAM, with groups formed around province, race, and gender and education of the head of the household (details of the household group formation appear in the Appendix, section 3.2). As shown in Table 4.1 the relative contribution of within-group sum of squares declines from 98 per cent when only 9 groups (provinces) are formed to 69 per cent under the fully disaggregated set of 162 household groups.

Table 4.1: Household Groups and Within- and Between Group Sum of Squares of Income

Number of household groups (<i>G</i>)	Disaggregating...	Within- and between group contributions to overall sum of squares	
		Within-group (share <i>SSW</i> in <i>SST</i>)	Between group (share of <i>SSB</i> in <i>SST</i>)
9	By province	98%	2%
29	... add race	81%	19%
54	... add gender (household head)	81%	19%
132	... add education (household head)	75%	25%
162	... add income	69%	31%

Source: Author's calculations based on IES/LFS 2000 data.

Within- and between-group distributions have also been explored in the context of inequality. The Theil-L (*L*) measure of inequality is derived from the notion of entropy in information theory. Estudillo (1997) defines *L* in terms of a welfare measure (y_i), the population size (n) and the population mean income (μ):

$$L = \frac{1}{n} \sum_{i=1}^n \ln \left(\frac{\mu}{y_i} \right) \quad [4.3]$$

This measure can be decomposed to show the relative contributions of within- and between-group inequalities to overall inequality in the economy for a population disaggregated into k distinct groups (see Leibbrandt et al., 2001). In equation [4.4] below the component L_B is the between-group contribution and is calculated in the same way as *L* before, but assumes that

all incomes within a group are equal. L_j is the Theil inequality measure within the j^{th} group in the sample, while q_j is the weight attached to each within-group inequality measure. This weighting factor is the proportion of income accruing to the j^{th} group. An alternative formulation of the Theil inequality measure, called the Theil-T index, uses population weights (p_j) as the weighting factor, which makes it similar to the method applied in an ANOVA application.

$$\begin{aligned} \text{Theil-L: } L &= L_B + \sum_{j=1}^k q_j L_j \\ \text{Theil-T: } T &= T_B + \sum_{j=1}^k p_j T_j \end{aligned} \quad [4.4]$$

Intuitively, as more household groups are formed, the weighting factors q_j or p_j become smaller, and hence the inequality within a certain group contributes less to overall inequality. It follows that a change in inequality within a specific group will have less of an impact on the change in overall inequality when there are many groups. Furthermore, as explained previously, higher levels of disaggregation, if done sensibly, will cause groups to become increasingly homogeneous, also in terms of their welfare or income levels. The within-group inequalities (L_j or T_j) will therefore also decline.

Table 4.2 below shows within- and between-group shares of inequality for the different aggregations of the household groups in the PROVIDE SAM. It is clear from these results that a higher level of disaggregation shifts the weight significantly towards the between-group inequality. Whereas only 8 per cent of overall inequality is explained by between-group inequality when 9 groups are formed, almost two-thirds is explained with a fully disaggregated set of 162 household groups, a share that is significantly higher than found earlier under the ANOVA illustration.

Table 4.2: Household Groups and Within- and Between Group Income Inequality

Number of household groups (k)	Disaggregating...	Within- and between group contributions to overall inequality (Theil-L)		Within- and between group contributions to overall inequality (Theil-T)	
		Within-group (share of L_B in L)	Between group (share of $\sum_{j=1}^k q_j L_j$ in L)	Within-group (share of T_B in T)	Between group (share of $\sum_{j=1}^k p_j T_j$ in T)
9	By province	91.6%	8.4%	90.7%	9.3%
29	... add race	57.2%	42.8%	64.0%	36.0%
54	... add gender	54.5%	45.5%	58.9%	41.1%
132	... add education	43.9%	56.1%	45.6%	54.4%
162	... add income	37.8%	62.2%	40.5%	59.5%

Source: Author's calculations based on IES/LFS 2000 data.

Once again it appears as if within-group inequalities decline as groups become more homogenous. A simple yet crude way to test this is to calculate the average within-group inequality across all the groups for different levels of disaggregation. Thus, if we let $\bar{L}_w = \sum_j L_j / k$ we find that \bar{L}_w is 1.00 when only nine groups are formed (this is only marginally lower than the national Theil-L index of 1.02), while \bar{L}_w is only 0.40 when 162 groups are formed.

Thus, the conclusion stands that when many household groups are formed, a large part of the overall inequality among households in the CGE model is captured by changes in between-group income distributions. Disaggregation therefore in effect endogenises a substantial part of overall inequality. Thus, even though the within-group income distribution is fixed in CGE models, much of the overall inequality is still captured when the model is highly disaggregated. In fact, as models become more disaggregated and household group members become more homogenous, the assumption that these members are affected the same by a policy (i.e. the within-group variance does not change) becomes more valid.

This is an important topic we return to when the micro-modelling results are presented in Chapter 5 and Chapter 6. In reality the issue is much more complex, especially when the income changes at the household level originate from a labour market shock with substantial impacts on wages or employment levels. Even if households are very similar in terms of their household-level characteristics, it remains very difficult to disaggregate households in a SAM on the basis of labour market characteristics. This is especially true when labour market shocks can potentially impact on several individuals in the household, each of whom have unique linkages with the labour market. Given this, even results from a model with many household groups should be treated with caution, especially where factor-market induced distributional effects are evaluated.

3.1.3. *Incorporating ‘Real’ Households in an Integrated CGE Macro-Micro Framework*

Cockburn (2006:3) agrees that the “*problem of intra-category variation decreases with the degree of disaggregation*”, but still argues that even the most disaggregated versions – he cites Piggott and Whalley (1985) who included over 100 household categories – still suffer from “*substantial intra-category heterogeneity*”. He therefore proposes a model using ‘real’ households, i.e. where each household as represented in a household survey is included as a separate account in the SAM. Cockburn (2006) originally applied his approach to Nepal, which already had an aggregated SAM. His aim was to then use data from a Nepalese household survey with approximately 3 400 households to incorporate more detail into the SAM. Cockburn (2006) describes his approach as a fully integrated macro-micro model as

opposed to the top-down sequential approaches to macro-micro modelling (see sections 3.2 and 3.3).

Technically speaking, this approach still follows the representative household group approach in the sense each household sampled in a household survey and now included in the SAM is still representative of other households in the economy (hence the use of sampling weights in survey data analyses). The main difference, however, is that each household's *behaviour* is derived from that of a single 'real' (or actual) household. This approach effectively deals with the problem of collective rationality in aggregated models. Furthermore, poverty headcount ratios can also be calculated with much greater accuracy compared to highly aggregated models.

The downside is that the approach can be quite taxing, especially in terms of data and computing requirements. The use of individual survey units in a macro-model places a substantial burden on the survey data and hence requires very good quality data. Observations that contain outliers, for example, may cause results for some households to be unrealistic. Under the standard representative household group approach such data errors are conveniently concealed through averaging.

A further and perhaps more problematic data requirement is that full reconciliation is necessary between the micro- and macro datasets, something that is often not required in the top-down approaches (see later). In theory the process of integrating the macro and micro datasets is fairly straightforward. Cockburn (2006) explains that the process starts with an existing balanced SAM, which has two important features, namely (1) row and column totals match, i.e. the SAM is balanced, and (2) the aggregates in the SAM are consistent with those in the national accounts of a country. A new set of fully disaggregated household row and column accounts are inserted in the place of the existing household groups. This causes the SAM to become unbalanced either because individual household income and expenditure estimates are not reconciled in the survey data or because aggregate household incomes or expenditures are underreported in the survey compared to national accounts.⁴⁹

It is therefore necessary to rebalance the SAM, which is achieved by applying standard SAM balancing techniques. This involves allowing SAM coefficients to change until the SAM is fully reconciled, and hence the balancing process may lead to changes in the households' income and expenditure structures (Savard, 2003). This may cause poverty and inequality estimates as calculated from the balanced SAM to differ from the original estimates in the

⁴⁹ Such underreporting is not uncommon in household surveys. While this inconsistency may relate to incorrect sampling weights in the survey, it more often relates to the fact that household surveys and national accounts data are collected in very different ways and from entirely different theoretical perspectives.

survey data. In an application of this balancing process to a South African SAM, Cockburn et al. (2007) claim that despite substantial reweighting and balancing, they still obtain poverty and inequality indicators that are “*close to official figures*”. This is quite surprising given the substantial underreporting in the IES 2000 when compared against National Accounts estimates (see earlier discussions in Chapter 2), but possibly relates to the fact that they adjust sampling weights rather than actual income or expenditure estimates of individual households.

Balancing such a large SAM is a complex computational endeavour. Cockburn’s (2006) initial application in Nepal was based on a survey with 3 400 households, which is relatively small. The South African IES 2000, for example, which was used as a basis for the household account disaggregation in Cockburn et al. (2007) contains close to 30 000 households. It is practically infeasible to include 30 000 households in a SAM and still successfully balance it. Cockburn et al.’s (2007) solution to this problem was to use a random sample of 8 000 households rather than the full sample. This method requires that sample weights are adjusted upwards in order to still produce aggregate estimates that are consistent with the national accounts. A smaller sample size and larger weights implies that confidence intervals increase, thus reducing the reliability of estimates used in the SAM.

Once the SAM is balanced and the CGE modelling phase is reached, computational constraints still play a role given the sheer number of simultaneous equations that have to be solved. Although this problem is continually diminished thanks to rapid gains in computing power, a pragmatic solution in the mean time is to limit the overall number of non-household accounts in the SAM. In Cockburn’s (2006) SAM, for example, there are only six labour factors. Having very few factor groups seems to defeat the objective of having many household groups since any income gains or losses accruing to households via the factor market will be ‘averaged out’ in the functional distribution matrix. Thus, unless the policy shocks evaluated largely bypass the factor market, it makes little sense to have many households and very few factors of production.

A related modelling aspect of this integrated CGE modelling approach has to do with the way in which job losses or gains are (implicitly) allocated among the real households. Cockburn’s (2006) model actually operates similarly to the standard CGE model in the sense that factor income changes are distributed among household groups in the same proportions as in the base (as determined by the functional distribution matrix). By extension, under an unemployment closure where wages are fixed, new jobs created in the economy are also distributed across household groups in the same proportion as in the base (and vice versa for employment losses). From this perspective even a fully integrated approach is still unable to

deal properly with differences among individuals within households and how this may affect labour supply decisions and earnings capacity of individuals.

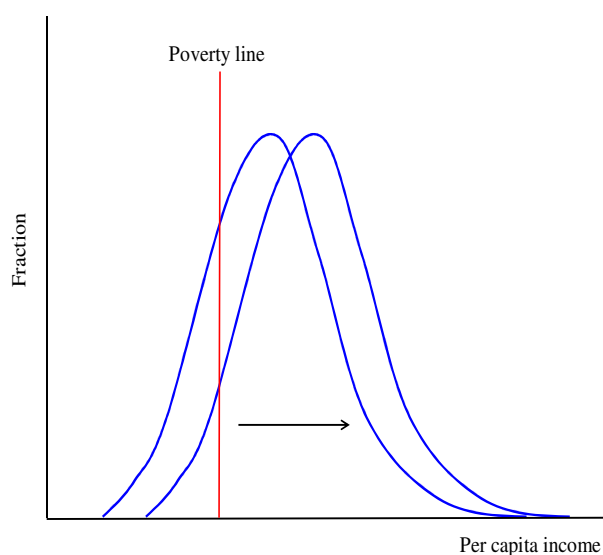
Based on the preceding discussion there seems to be little justification for the use of a fully integrated approach in this study. When doing labour market policy analysis it is important to have a detailed specification of the functional distribution matrix. It may well be that a more ‘balanced’ SAM with many households *and* many factor groups that better capture the overall distributional picture would produce better results. The use of real household also does not solve the problem of identifying individual labour market participants that enter or exit employment, which makes it as limited as a standard representative household group approach. We next consider the options for linking CGE models and micro-models sequentially, an approach that has come to be known as macro-micro modelling.

3.2. Top-Down Macro-Micro ‘Incidence’ Models

A second macro-micro modelling approach is a top-down ‘incidence’ model. This is the simplest of sequential macro-micro models and combines information about aggregate changes in income at the representative household group level as reported in the CGE model with information about the underlying income distributions within those representative household groups. Since the intra-household group income distribution is assumed to be fixed in a CGE model, any change in the aggregate income of a representative household group is shared equally among its members, which causes the entire within-group distribution to shift to the left or the right. The within-group distribution itself does not change shape. This effect is illustrated in Figure 4.4, which plots the pre- and post-simulation distributions against some notional poverty line. The poverty effect within a representative household group is easily derived from the figure, and will depend, firstly, on how income is distributed within the group relative to the poverty line, and secondly, on the size of the income effect (Davis, 2003).⁵⁰

⁵⁰ The approach can be refined by incorporating CGE model results about changes in household-specific consumer prices, the idea being that any change in the cost of a particular household’s consumption bundle affects that household’s spending power and hence its welfare level. This approach to macro-micro modelling is sometimes called micro-simulation modelling in the literature, but in terms of the terminology adopted in this study this is misleading. The micro-level analysis involves no behavioural modelling, and hence this approach is better described as a non-behavioural or incidence approach.

Figure 4.4: Within-Group Income Distribution Shifts



CGE-micro-incidence analyses require some knowledge of the shape of the within-group income distributions of representative households. If information about the true within-group income distribution is not available, some hypothetical distribution has to be assumed. Alternatively, if the survey data that was used to construct the representative household groups in the SAM is available, this can be used to calculate poverty measures within a standard software package using the survey data directly. These two options are considered below.

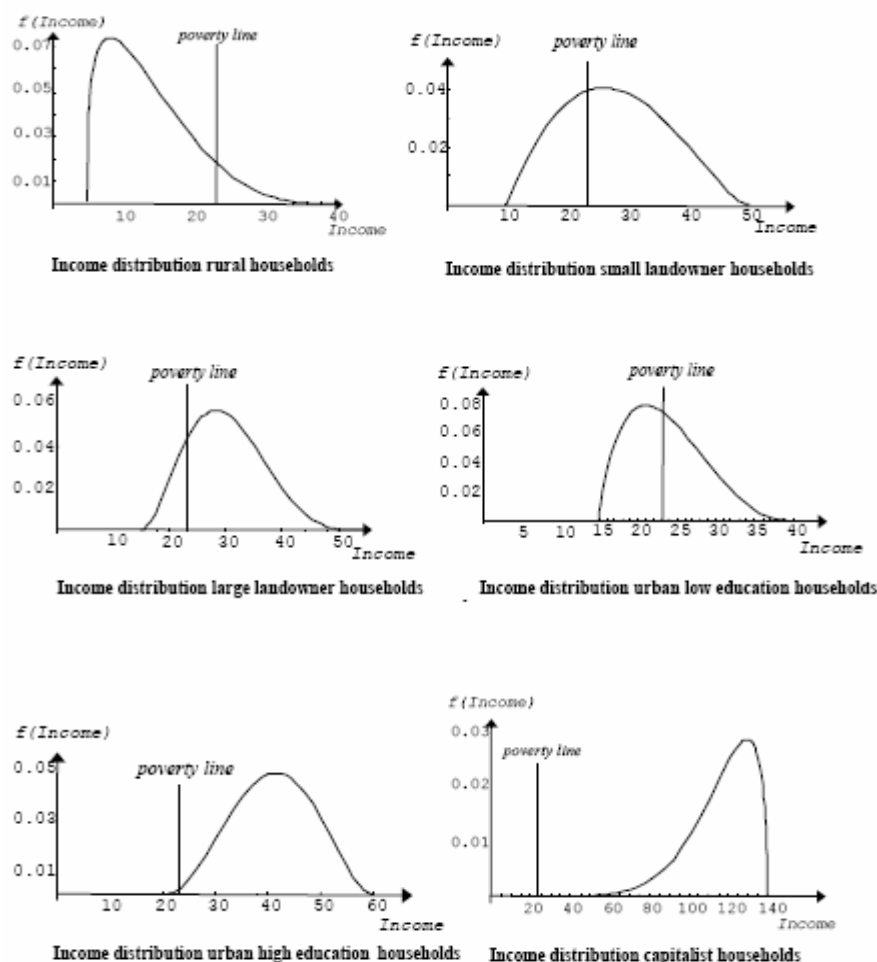
3.2.1. Hypothetical Income Distributions

In some instances a CGE modeller will have access to a SAM but will have no knowledge about the parameters of the income distribution underlying each representative household group. This may happen, for example, when a SAM is published by a central statistical agency without any further supporting documentation or data. If the CGE modeller wants to use a micro-incidence approach it will be necessary to assume that the underlying within-group income distribution functions are defined by some mathematical function. Various functional forms have been used in the past, including the lognormal and Pareto distributions. However, according to Decaluwé et al. (1999) the statistical literature suggests that other functional forms might be more appropriate. In particular, these authors propose using the Beta function, which is much more flexible than the lognormal function as far as its possible asymmetric forms are concerned.

To illustrate this, Decaluwé et al. (1999:28) use a hypothetical SAM with six household groups common to a “*archetype African country*”, namely rural households, small landowner households, large landowner households, urban low-education households, urban high-

education households and capitalist households. Four parameters, namely the minimum and maximum income levels in the group and parameters that determine the shape and skewness of the function, are then specified to define what the distribution function looks like and where it is located relative to the poverty line. These functions are shown in Figure 4.5.

Figure 4.5: Beta Distribution Functions for Different Household Types



Source: Decaluwé et al. (1999)

Of course, these functional forms are completely hypothetical and might be based on anecdotal knowledge. Ultimately the shape and positioning assumed will be crucial in determining the overall poverty effects.

3.2.2. Real or Actual Income Distributions

When the income information underlying representative household groups and information about how they were constructed are available, it is unnecessary to assume a hypothetical within-group distribution function. The survey data represents the true income distribution in the economy, and this information can be used directly in the micro-component of the model. When income levels of households are adjusted on the basis of information from the CGE

model, poverty measures can be calculated and compared against the base in standard comparative static fashion. Although the process of analysing poverty effects is the same as under the hypothetical distribution approach, there are two distinct advantages: firstly, there is no concern over the shape or positioning of the distribution function, and secondly, it is possible to identify actual households in the survey data that are likely to be poor or non-poor before and after a shock.

There are two possible options when linking CGE results with the micro-incidence model. The first is to increase (or decrease) each household group member's income by the same *amount* as the change in the average group income as reported in the CGE model (approach A). The second option is to change each household group member's income by the *percentage* by which the average income of the group changes, i.e. a uniform proportional change in income is applied (approach B). These approaches are illustrated algebraically below. If x_i is the average income of household i prior to the shock, \bar{x} is the group mean as per the original SAM data, and the related post-simulation shock values are indicated with an asterisk (*) superscript, then the alternative approaches are:

$$\begin{aligned} \text{Approach A: } x_i^* &= x_i + (\bar{x}^* - \bar{x}) \\ \text{Approach B: } x_i^* &= x_i \left(\frac{\bar{x}^*}{\bar{x}} \right) \end{aligned} \quad [4.5]$$

Both these methods have been used in the literature. If approach A is followed the mean group income as calculated from the survey has to be consistent or comparable with the mean group income as reported in the SAM, i.e. full consistency is required between the micro- and macro datasets.⁵¹ This is seldom the case unless the survey data is adjusted explicitly. Decaluwé et al. (1999) (see earlier) use approach A, but since their underlying income distribution is a hypothetical one the consistency issue is irrelevant. In most practical applications approach B is favoured (see for example Pauw and McDonald, 2006, and Thurlow, 2007).

The method followed has important implications for poverty and inequality results, but this issue is largely ignored in the CGE macro-micro literature. Recall that the standard criticism levelled against the representative household group approach is that the assumption of constant within-group *distributions* makes it ill-equipped to analyse changes in *inequality*. The problem with this kind of criticism is that the concepts of distribution and inequality, although related, are not the same. When approach A is followed, the within-group *variance*,

⁵¹ In theory, if there is full consistency between the micro- and macro-datasets, both approaches A and B will actually yield the same average income change in the survey data. The use of survey weights may, however, distort estimates somewhat. For example, if households at the lower end of the income distribution have a larger average weighting factor than those at the upper end of the distribution, the overall weighted percentage change will be lower than the average change as per the CGE model.

which is a measure of the dispersion or distribution of the income variable, stays constant. This is the example where, as shown earlier in Figure 4.4, the entire group's distribution shifts horizontally while the shape of the distribution function stays the same. This can be easily verified by examining the following property of the variance, where k is the constant term that is added to every element in a stochastic variable (x) (i.e. $a = 1$).

$$\text{var}(ax + k) \equiv a^2 \text{var}(x) \quad [4.6]$$

When a uniform proportion change is applied (approach B), e.g. each element in x is multiplied by a constant factor a ($a \neq 1$), the variance will increase by a^2 . Most of the standard inequality measures used in the literature, including the Gini coefficient, the Theil indices and Atkinson's measures, are said to be scale independent (Litchfield, 1999). This means inequality remains unchanged if there is such a uniform proportional change in an income variable. The variance does not satisfy this income scale independence condition and hence is not usually considered a true measure of income inequality. Inequality does, however, increase (decrease) when all incomes in a distribution are increased (decreased) by the same fixed value (approach A).

Ultimately it probably does not matter a great deal which approach is used. The choice is really subjective and often comes down to what is practical and feasible given the nature of the underlying survey data. For this reason approach B is also adopted in this study. It remains important though to realise the implications of the approach selected. Either the variance or the inequality within representative household groups will stay constant; it cannot be both.

3.2.3. *What about the Allocations of Job Gains and Losses?*

The one area where the micro-incidence approach still has shortcomings is in terms of the allocation of job gains or losses among individuals. As noted before, under an unemployment closure, CGE models implicitly allocate any job gains or losses among household groups following the distribution of jobs in the base. This limitation in the CGE model is not resolved in the micro-incidence model, and hence the issue deserves further attention.

In a job loss scenario it is quite plausible that households that are linked to employment opportunities will lose out when those employment opportunities are taken away (for example in a minimum wage context). Importantly, however, is the assumption here that job losses will follow the distribution of jobs in the base, i.e. the model basically assumes that each employed individual has the exact same probability of becoming unemployed.

If this strong assumption were made, one would then also have to assume that each jobseeker (or unemployed person) had an equal chance of finding employment under a job creation

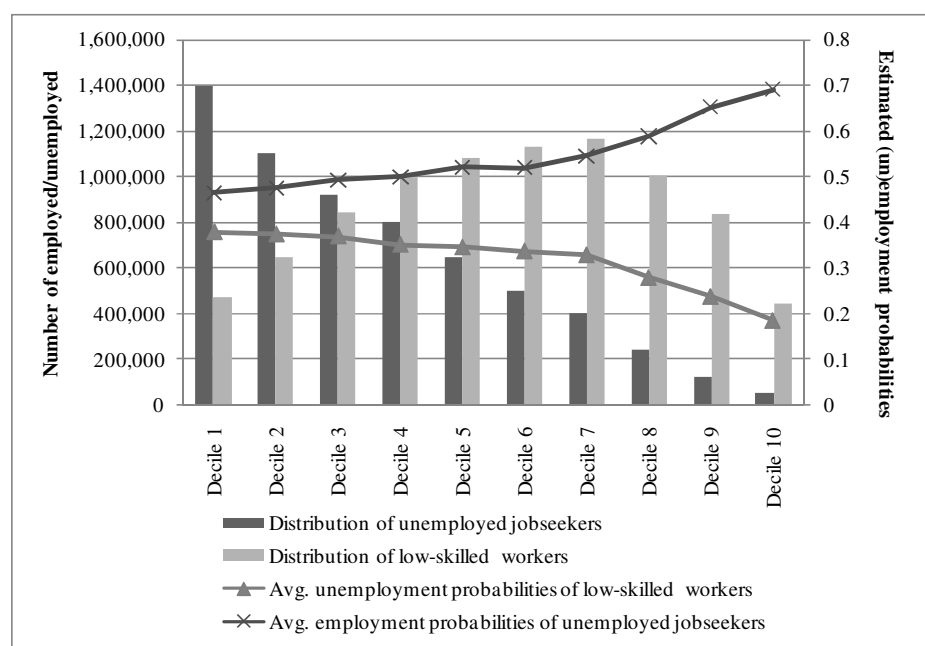
scenario. Under such an assumption job gains would be distributed in the same way as the unemployed are distributed in the base. This is not the case in the CGE model, and by extension, also not in the CGE-micro-incidence model. The CGE model disregards the distribution of the unemployed across representative household groups (unemployment is regarded as something that exists outside the CGE model) and allocates any new jobs across household groups in the same way as existing jobs are distributed in the base.

Figure 4.6 shows the distribution of low-skilled workers and the unemployed (broad definition) across different household income deciles (see bars). Low-skilled workers, as explained earlier, are represented by a factor group for which an unemployment closure is typically selected in the CGE model; hence employment changes will be observed at an economy-wide level when minimum wages or wage subsidies are modelled. This data also forms the basis of the employment data in CGE model, and hence provides a good indication of what we can expect in terms of distributional results. Under the representative household group assumption both job gains and losses will tend to be distributed in the same way as which low-skilled workers are distributed in the base, i.e. both these policy shocks are likely to have the greatest impact in the middle-income deciles. Perhaps a more realistic outcome for the job gain scenario under a wage subsidy scenario would have been if gains were distributed in the same way as the unemployed are distributed in the base, i.e. if the lower income deciles benefited the most.

Also shown in Figure 4.6 are estimates of the average employment probabilities of jobseekers and unemployment probabilities of low-skilled workers (line graphs).⁵² If it was believed that job losses were not random but rather depended on personal characteristics of individuals, job losses might have been biased against low-skilled workers in the lower income deciles as indicated by the higher unemployment probabilities for these poorer workers. Job gains, on the other hand, would mostly benefit wealthier jobseekers if they were determined by people's employment probabilities rather than the distribution of jobs in the base.

⁵² These probabilities are based on an employment-unemployment probit model, which was estimated using the IES/LFS 2000 data. This merely serves as a (fairly crude) illustration, and hence estimation results are not shown. Age, race, gender, location and education were included as independent variables.

Figure 4.6: Employed and Unemployed by Household Income Deciles and RHGs



Source: IES/LFS 2000 and PROVIDE SAM

This fairly crude analysis suggests that the representative household group approach, and by extension the CGE-micro-incidence approach, would actually yield results that are more favourable for middle- and lower-income households. Savard (2004) also detects such a ‘pro-poor bias’ when comparing pro-poor policy impacts in a CGE-representative household group model with results obtained in his CGE-micro-simulation model. The latter modelling approach considers individual characteristics when deciding how job gains and losses are distributed among individuals. We turn to a discussion of such a modelling approach below.

3.3. Top-Down Macro-Micro ‘Simulation’ Models

A third approach is the top-down macro-micro ‘simulation’ model. The simple ‘incidence’ approach to macro-micro analyses discussed above is based on the assumption that gains or losses accruing to a *specific* representative household group are distributed uniformly (in absolute or proportional terms) among the individual group members within that group. As an attempt towards improving our understanding of the macro-micro linkages, such an incidence approach is useful, but it still does not escape the main limitation of the representative household group approach to CGE modelling, namely that the within-group distribution function is fixed or exogenous. The quest for finding ways in which within-group distributions could be endogenised in order to reduce the arbitrariness of the above assumption received a significant boost with the development of the first CGE-micro-simulation models in the late 1990s and early 2000s. Robilliard et al. (2001) provided one such macro-micro modelling framework which has subsequently been followed by many

others, in particular applications to South Africa by Herault (2006), Essama-Nssah et al. (2007) and Go et al. (2009).

3.3.1. Basic Principles of Macro-Micro-Simulation Models

The basic principles of the CGE-micro-simulation approach are similar to the top-down incidence approach described above. The idea is to first run an economic policy shock in the CGE model and to then link key results from the CGE model with the micro-simulation model in a sequential manner. The micro-simulation model, which in this context is essentially a labour market behavioural model (participation decisions, the allocation of job gains and losses and earnings are modelled), is then run separately to simulate micro-level behavioural effects in the labour market. These changes may ultimately impact the way in which income is distributed within household groups, and hence this modelling framework not only endogenises the within-group distribution of income, but may even produce a very different distributional outcome than the CGE model.

Apart from the fact that micro-simulation models account for behavioural changes of individuals, a further important difference between the micro-incidence approach and the micro-simulation approach lies at the interface between the macro and micro-models. In the micro-incidence model changes in *real household incomes* as reported in the CGE model are linked with individual households in the micro-model. In contrast, given the focus on labour market behaviour in micro-simulation models, the interface in this modelling framework is primarily at the labour market level. This means that key labour outcomes in the CGE model, most notably changes in *wages and employment levels*, are linked to individuals in the micro-simulation model.⁵³ These individuals are in turn linked to their respective households once micro-level behavioural responses have been taken into account. In a sense, therefore, when the micro-simulation approach is opted for, changes in household incomes as predicted by the CGE model are largely ignored and an entirely new income distribution is estimated in the micro-simulation model via careful modelling of labour market behaviour.

Micro-simulation models used in a CGE context are typically made up of three blocks of equations. The basic principles are derived from standard occupational choice models (see earlier discussion in section 2.1, as well as reference to applications of occupational choice modelling results in Chapter 2). In the first block of equations the discrete occupational choices of individuals are specified, i.e. individuals are allocated to (or ‘choose’ from) inactivity or unemployment, wage work, self-employment and so on. The discrete choices in this regard may depend on the modeller’s preferences, data availability and so on. Robilliard

⁵³ As we show below some other household-level results that are important in explaining changes in household incomes are also linked to the micro-simulation model, including returns to capital, changes in income taxes (where appropriate) and changes in household-specific CPIs.

et al. (2001), for example, include three occupational choices (inactivity, wage employment and self-employment) in a single step, while Herault's (2006) model for South Africa includes five possible outcomes (inactivity, unemployment, subsistence agricultural worker, informal employment and formal wage employment) in a two-step approach that controls for selection bias in the estimation of the employment-unemployment probit model estimated in the second step. Occupational choice is typically specified as a function of personal characteristics, which, in addition to the standard demographic and labour market characteristics (e.g. education, skills and experience), also includes predicted earnings. This is an important feature of the occupational choice equation. A wage or earnings function is estimated separately as part of the second block of equations (see below), with earnings then entering into the occupational choice equation. The idea is that a change in potential earnings may bring about a different occupational choice for individuals.

In the second block of equations the (log) wage of member i in household m is specified as a function of that individual's personal characteristics (x_{mi}) and a residual term (v_{mi}) (see equation [4.7]). The function is specified separately over several segments in the labour market, typically disaggregating by gender, skill/education, region, and so on. Usually the disaggregation is determined by the factor account structure in the CGE model or SAM. If relevant, a profit function is also specified for self-employed individuals, defined now at the household level and dependent, firstly, on the number of household members involved in an entrepreneurial activity (N_m) and, secondly, on the type of activity (Z_m). The term profit in this context can be interpreted as returns to physical and human capital owned by the household.

$$\begin{aligned} w_{mi} &= w(x_{mi}) + v_{mi} \\ y_m &= y(N_m, Z_m) + \eta_m \end{aligned} \quad [4.7]$$

The final block of equations includes a household income equation and a price deflator. The price deflator (P_m) takes into account household-specific consumption shares, while the income equation is simply a household-level aggregation of real individual incomes (w_{im}), and household incomes such as profits (y_m) and exogenous incomes (y_{0m}). In some formulations (for example in Herault, 2006) income is expressed net of income taxes (t_m), as shown in equation [4.8] below. Although the main interface between the CGE and micro-simulation models is at the labour market level, it is clear from this equation that several other results variables are also linked in order to fully replicate income generation at the household level.

$$Y_m = Y(P_m, \sum_i w_{im}, y_m, y_{0m}, t_m) \quad [4.8]$$

Once all the equations have been estimated, a CGE simulation is performed and all the relevant model results are passed down to the micro-simulation model. The nature of the factor market results generated in the CGE model and linked with the micro-simulation model is dependent on the closures selected for specific types of factors of production. Thus, under an unemployment closure (low-skilled workers) wages are fixed (unless changed exogenously as in the minimum wage simulations) and employment levels adjust both at sectoral and national level. Average wages as well as sectoral wage and employment levels of fully employed skilled workers may change. All these wage and employment changes observed at the relevant factor group level are passed down to individual members of these factor groups in the micro-simulation model.

As far as capital stock is concerned, the level of capital stock employed is typically fixed within sectors under a short-run closure or fixed at the economy-wide level under a long-run closure (intra-sectoral capital mobility). Under both these closures the economy-wide and/or activity-specific returns to capital may change. Either way, when returns to capital adjust, the base-level profits of households (y_m) are adjusted accordingly in the micro-simulation model. Note that for both wages and profits the percentage change results in the CGE model are simply applied in the micro-simulation model as this avoids the need to fully reconcile micro (survey) and macro (SAM) data (see Go et al., 2009, Herault, 2006).

Changes in wages and profit levels may alter individuals' labour market participation decisions. Thus, once a policy shock has been simulated in the CGE model, a new set of labour market participants is generated in the micro-simulation model's occupational choice equation. Expected wage and profit incomes form part of the decision-making process. All labour market entrants now compete for jobs that are available in the economy. The final employment levels targeted in the micro-simulation model are determined in the CGE model. Although in theory any new participants, whether skilled or unskilled, can compete for employment opportunities, most of the changes in employment relate to changes in employment levels of unskilled workers as reported in the CGE model. Here the predicted employment or unemployment probabilities of labour market participants are used to determine which individuals become employed or unemployed using a simple ranking process.

Finally, changes in employment, wages and profits are used to calculate a new household income level for each individual household with the use of the household income equation. Other household income sources include a variety of transfers from government or other domestic and foreign institutions. These are usually fixed or exogenous in the CGE models and hence do not affect household incomes unless changes are explicitly modelled (y_{0m}). The gross income of households is further adjusted to account for commodity price and household

income tax changes, thus producing a measure of real disposable income at the household level. The change in this income measure provides an indication of the real welfare change at the household level. This measure is generated independently from the income of the representative household group in the CGE model to which the individual household is attached.

3.3.2. A General Critique of Macro-Micro-Simulation Models

Micro-simulation models seem to improve on standard CGE models and micro-incidence models because they explicitly account for individual behavioural changes, which allows for a much more nuanced modelling of the functional distribution in the economy. However, the modelling approach does raise a number of concerns. These are discussed below under three broad themes, namely (a) issues around consistency between the macro- and micro-simulation models, (b) hiring and firing processes simulated in the micro-simulation model and (c) general remarks around probabilistic occupational choice-type models.

a) Consistency Issues

The first concern relates to the issue of consistency between CGE and micro-simulation models. This is specifically with regards to the treatment of labour and the labour market closures assumed in the respective models. The CGE model is essentially demand-driven, with a change in labour demand leading either to an increase in employment (unemployment closure) or wages (full employment closure). Labour supply decisions are not explicitly considered, at least not in the standard CGE model setup. The micro-simulation model, in contrast, allows individuals to change their participation decision in response to a policy shock. This poses problems for skilled employment in particular. If skilled wages increase in the CGE model the micro-simulation model will predict an increase in labour supply. However, the overall number of skilled jobs in the economy will stay unchanged in terms of the full employment closure in the CGE model, which means that unemployment among skilled workers will rise. Some labour market churning may be allowed for in the micro-simulation model (see point (b) below), which means that new entrants may in fact find employment, but this will be at the expense of other skilled workers. Such a result seems counter-intuitive, especially in a country with skills shortages.

CGE-micro-simulation modellers have devised two ways of dealing with this inconsistency. The first option represents an approach that has not been widely adopted in the CGE-micro-simulation literature and involves setting up a ‘top-down-bottom-up’ iterative macro-micro model. Such a ‘bi-directional’ model was developed by Savard (2003). Essentially, when the micro-simulation model predicts an increase in labour market participation, the labour supply level is adjusted accordingly in the CGE model where a full employment closure is still

maintained. The process is repeated until the supply response in the micro-simulation model is zero, i.e. a stable equilibrium is reached. The algorithm that is required for this iterative process is highly complex. Savard (2003:7) explains that such a “*regime switching mechanism is not possible with standard software such as GAMS*” (the software typically used to programme CGE models), and hence this remains a very difficult model to set up within the standard CGE coding framework.

The second option is to adjust the micro-simulation model coefficients so that employment results produced are consistent with those of the CGE model. Robilliard et al. (2001) explain that in reality consistency is required in three sets of variables: (1) changes in average wage earnings (formal or self-employment) in the micro-simulation module must be equal to changes in the wage rates in the CGE model for each labour market segment; (2) changes in consumption price vector must be consistent; and (3) employment levels in each labour market segment must be consistent.

The first two conditions are automatically ensured if percentage changes (as opposed to absolute levels) in prices and wages are passed down to the micro-simulation model and applied uniformly to the relevant labour market segments or household income equations, as is done by Herault (2006) and Go et al. (2009). However, in order to ensure consistent employment results without having to model a feedback effect to the macro-level model, it is necessary to make adjustments to the coefficients in the occupational choice section of the micro-simulation model. This is achieved by solving a set of simultaneous equations that produce a new set of coefficients for the micro-simulation model. Details of this process are available in Robilliard et al. (2002) (in the case where consistency is required in all three sets of variables) and Herault (2006) (in the case where consistency is only required in the labour supply equation). In many respects this seemingly ad hoc adjustment to the model coefficients could be considered one of the great drawbacks of this approach. It seems convoluted to set up a complex micro-simulation framework that allows for behavioural responses only to ‘alter’ this behaviour again in order for the model to produce results that are consistent with the CGE model.

In the case of an unemployment closure, which is typically assumed for low-skilled workers, and in a scenario where (say) the economy expands and there is an increase in labour demand, the CGE model assumes there are always enough unemployed low-skilled jobseekers to satisfy demand. Thus, the CGE model will predict a certain increase in employment of low-skilled workers, and the micro-simulation model is then used to identify the individuals that would gain from an increase in employment by comparing the employment/unemployment probabilities of suitable jobseekers as predicted by the occupational choice model. Since wages are generally fixed under an unemployment closure,

there is no labour supply response in the micro-simulation model. The only requirement for the micro-simulation model is that there are in actual fact enough suitably qualified jobseekers (as identified in the survey data). The main role of the occupational model in this instance is to allocate job losses or gains among individuals on the basis of their predicted employment or unemployment probabilities. Under this labour market closure the micro-simulation model is therefore quite appealing.

A related consistency issue pertains to the income distribution in the two models and the implication this has for general equilibrium consumption effects. A CGE model works on the principle that policy shocks have direct and indirect effects, with indirect effects mostly relating to demand-side responses of consumers. Thus, changes in household disposable income or consumer prices will induce changes in aggregate spending and consumption patterns in the economy. The disaggregation of households is important in this regard, as different households are affected differently by policy shocks and also exhibit different spending patterns. For example, if relatively poorer households experience an increase in income they will most likely allocate more of this increased income towards expenditure on food and basic consumption goods. Relatively richer households are more likely to spend their marginal income on luxury goods and services, while they also typically have higher savings rates.

Micro-simulation models endogenise the within-group income distributions and produce a disposable income vector that is potentially very different from that generated in the CGE model. In the standard top-down approach no feedback from the micro-simulation model back into the CGE model is modelled. Full consistency would only be achieved if the final consumption demand vector in the CGE model is adjusted at successive stages in the modelling (i.e., as part of each iteration) so that it is now consistent with the income vector in the micro-simulation model. This particular linkage appears to be one of the more challenging ones to set up in a top-down-bottom-up iterative model (see Savard, 2003).

Of course, this problem may not be as significant as it is made out to be. Aggregate income changes are usually consistent in the two models. This means that the inconsistency relates mostly to compositional effects and not so much scale effects. Thus, when in the micro-simulation income is redistributed towards households that have dramatically different preferences or expenditure patterns, it may become a concern. The inconsistency is somewhat amplified in dynamic CGE models where capital accumulation patterns adjust to changing consumption demand conditions. In a static model framework, however, this concern is more academic in nature. Poverty and inequality measures will not likely vary significantly whether feedback is modelled or not, which is why Essama-Nssah et al. (2007:51) in their

application to South Africa (the same model used in Go et al. (2009)) argue that “*no recursive feedback into the macro model was found necessary*”.

b) Hiring, Re-Hiring and Firing Processes

Micro-simulation models, as shown, explicitly aim to consider the processes of hiring, re-hiring and firing of individuals. As such they can provide interesting insights into the distributional effects of policies, particularly labour market policies. CGE models are generally unable to deal with the issue of whether those workers that are released from declining sectors are the same ones that are re-hired again in expanding sectors. Certainly, in terms of the full employment closure, it is implicitly assumed that it is the same workers that are re-hired to reach full employment again. The micro-simulation model provides a framework within which these hiring, re-hiring and firing processes can be evaluated in a systematic way. Not only is the selection of people that are released from declining sectors based on a careful evaluation of these individuals' employment prospects, but once released, they can be added to a general pool of jobseekers from which expanding sectors select workers that are deemed most suitable for employment in that sector.

Where micro-simulation models might be problematic is in terms of predictions around employment gains and losses that take place within sectors and independently of whether the CGE model predicts a net increase or decrease in employment for that sector (see Herault, 2006). Micro-simulation models allow new labour market entrants to replace currently employed people if they have a higher probability of being employed. Such churning takes place within sectors even if the CGE predicted no change in employment in that sector. This may not be a fair reflection of hiring and firing processes in reality. Rigid labour laws such as those in South Africa would prevent a firm from dismissing an employee simply because a better qualified individual comes along. Very few modellers report the extent to which such churning takes place in their models. It is quite likely that incumbents have a fairly good chance of being hired again anyway, but essentially job security is not guaranteed under a model that permits sectoral mobility for workers.

c) Limitations of Probabilistic Models: Some General Comments

Probabilistic models are frequently used in labour market applications to predict employment or unemployment outcomes at a micro-level. As explained in the preceding discussions and earlier in section 2.1, the approach usually followed is to rank individuals by their predicted employment or unemployment probabilities, and to then on that basis identify the likely winners or losers. In reality, however, hiring and firing processes are much more complex and depend on whether changes in employment levels are induced by marginal employment changes at the firm-level or large contractions or expansions which lead to entire firms

shutting down or starting up. In theory probabilistic models are useful for predicting changes ‘at the margin’, but in the case where entire firms shut down or start up, hiring and firing will probably affect people with a mix of skills and characteristics representative of an entire firm and not only those ‘most suited’ to the industry type.

Probabilistic models can also sometimes produce erratic results. Pauw et al. (2007a) explore marginal changes in employment levels across broad industry groups, and find that a typical result when using probabilistic models to allocate small job gains or losses across individuals is that ‘blocks’ of individuals in the survey data with the exact same characteristics end up being selected for hiring or firing. This problem relates to the specification of the employment equation, and most notably the fact that there are only a limited number of independent variables that can be included. This means that when predicting employment or unemployment probabilities of individuals, there are large blocks of individual observations in the survey data with the same predicted probabilities. The problem of ‘lumpy’ results becomes less acute when employment changes are large enough to allow more than one of these homogenous blocks of observations to be selected. It can also be avoided by using unemployment probabilities as weights in a random draw rather than using the ranking method (see section 2.1.1).

Another concern raised by Pauw et al. (2007a) is the issue of the reliability or accuracy of predicted employment probabilities. Personal characteristics such as gender, race or province (location), which are typically included in these types of models, may be statistically important in terms of explaining existing (ex post) occupational outcomes, but they may not truly explain ex ante how hiring and firing processes might unfold. Labour market outcomes in South Africa, for example, have been distorted by past policies of discrimination and preferential treatment. Such biased treatment of labour market participants will simply be perpetuated in a probabilistic model unless specific targeting measures are incorporated in the modelling framework. Models of this nature are also rarely able to capture something as abstract as, say, ability. Several other variables, such as age, experience and education may stand proxy for ability, but ultimately such abstract (yet important) determinants of a person’s employment prospects are relegated to the error term in the model.

4. Modelling Approach Adopted for this Study

4.1. Top Layer: CGE Model

The primary method for analysing the economy-wide effects of minimum wages and wage subsidies in the following two chapters is through the use of a highly disaggregated CGE model. The CGE model itself is used primarily to evaluate the impact of the labour market policy shocks investigated in this study at a more aggregate level. In particular, we are

interested in results on sectoral employment changes for different skills groups, aggregate household income changes, prices, and, where relevant, taxation and financing issues.

This study makes use of the Standard General Equilibrium (STAGE) model developed by McDonald (2006), which is calibrated with a South African SAM with base-year 2000. This SAM was compiled by the PROVIDE Project (PROVIDE, 2006).⁵⁴ The version of the SAM used in this study includes 22 commodity accounts and 22 activities representing economic sectors. This disaggregation, while not as detailed as is permitted in the PROVIDE SAM, was selected for two reasons. Firstly, the activity structure allows for the precise identification of those sectors for which minimum wages are defined in terms of the sectoral determinations (see Chapter 5). Secondly, since one of the micro-simulation model equations is a multinomial logit model specified across all the sectors in the SAM, the number of accounts had to be limited to ensure that estimation is in fact feasible.

The preceding discussions have motivated for the use of a richly specified household and factor account structure, especially when evaluating poverty and distributional effects. Hence, the model includes 88 labour groups and 162 representative household groups. Details of how these groups were formed are provided in the Appendix (section 3.2). The same account structures are used in both applications.

4.2. Second Layer: Micro-Models

Poverty and distributional issues are not analysed in the CGE model directly; rather, we link two types of micro-level models, namely a micro-incidence model and a micro-simulation model, sequentially with the CGE model in order to produce improved poverty and distributional results.

4.2.1. *Micro-Incidence Model*

The micro-incidence model links changes in gross household income (in percentage terms) as reported for each of the 162 household groups in the CGE model to individual households in the micro-level model. For the minimum wage simulations the change in gross income is the same as the change in disposable income since taxes are fixed, and hence this is an appropriate welfare measure for analysing poverty changes in this particular application. In some of the wage subsidy simulations, however, household income taxes are adjusted endogenously in order to raise the additional revenue required to finance the programme. For these simulations it is therefore necessary to also link changes in household income tax rates observed in the CGE model to relevant individual households in the micro-incidence model.

⁵⁴ This author was a part of the Project research team between 2002 and 2005.

The gross household income variable is already expressed in real terms given that the CPI is selected as the numéraire in the model. However, since individual households in the CGE have unique consumption bundles and face unique price changes⁵⁵, it is appropriate to adjust the real income values in the CGE model by so-called household-specific CPIs. These are price indices constructed in much the same way as the national CPI, except for the fact that the price index is estimated separately for each household group in the CGE model, thus taking into account household-specific consumption bundles and prices. Household-specific CPIs are also expressed relative to the numéraire and are therefore expressed in real terms. Furthermore, since households adjust their consumption bundles in response to price changes by switching towards relatively cheaper goods, changes in household-specific CPIs are generally quite small. In the minimum wage scenarios, for example, changes range from -0.4 to 1.4 per cent.

Once changes in real gross household income (Y), income taxes (ty) and household-specific CPIs ($CPIH$) have been passed down from the CGE model to the micro-incidence model, it is possible to generate a new per capita disposable income variable ($PCDISPY$) for each individual household in the micro-model that is linked to a specific household group in the CGE model. These variables are specified for individual households in the micro-incidence model (subscript h) and/or for household groups in the CGE model (subscript H), while changes are strictly applied where $h \in H$. The new disposable per capita income variable ($DISPYPC_h^*$) is now simply calculated as follows in the micro-incidence model:

$$DISPYPC_h^* = [Y_h \cdot (1 + Y_H) \cdot (1 - ty_h \cdot (1 + ty_H)) \cdot (1 + \Delta CPIH_H)] / HHSIZE_h \quad [4.9]$$

In this equation the symbol Δ should be read as ‘percentage change in’, while $HHSIZE$ is the household size variable used to convert household incomes to per capita values. $DISPYPC_h^*$ can be compared against the base value ($DISPYPC_h$) in order to estimate changes in income, poverty and inequality. Importantly, the above method still assumes that the within-group income distribution (or inequality) stays unchanged since the same percentage changes in variables are passed down to each member of a representative household group. However, as argued, the high level of disaggregation in household group structure means that assumption of constant within-group distribution is less of a concern that it would have been for a highly aggregated model.

⁵⁵ Poorer households, for example, spend a greater proportion of their income on agricultural produce; hence the minimum wage in agriculture may cause their particular bundle to become relatively more expensive relative to other consumers’ bundles that are less food-intensive. Similarly, ‘domestic services’ is a luxury service used mainly by higher-income households. It is apparent that different households will be affected in different ways by minimum wage policies as far as consumption costs and hence true poverty levels are concerned. The same is true for the wage subsidy scenarios.

4.2.2. *Micro-Simulation Model*

The micro-simulation model specified for these analyses follows a similar sequencing structure as the ‘traditional’ micro-simulation models, but it is important to note upfront that this is not a true behavioural model. The use of the term ‘micro-simulation’ is therefore not entirely appropriate, but is nevertheless used to distinguish this model from the micro-incidence model described above. The reason why the model developed here is no longer a true behavioural model relates to the fact that the model component that allows individuals to alter their labour supply decisions in response to a policy shock has been ‘switched off’. This means that the set of labour market participants (employed and unemployed persons) is the same before and after the policy shock. People that are economically inactive in the base will always remain inactive; only those that actively participate, i.e. the unemployed in the base or those that lose their jobs as a result of the policy shock are considered for any vacancies that may arise in the economy.

The approach is justified for a number of reasons. Firstly, by locking down labour supply in the micro-simulation model many of the inconsistency problems discussed in section 3.3.2 are automatically dealt with, particularly those concerning labour supply of skilled workers. Secondly, since there is no real evidence in South Africa of a reservation wage, the assumption that people will not respond to wage changes due to (say) a minimum wage being implemented is not entirely unacceptable.

Thirdly, from a modelling perspective it is unlikely that the overall poverty results will be much altered whether currently inactive participants are allowed to enter or not. Many of the discouraged poor jobseekers in the economy have very similar characteristics to the economically inactive poor. Although the unemployment definition seems clear, the line between being economically inactive and a discouraged jobseeker is somewhat blurred. Active poor jobseekers are those that have not lost hope of finding employment, and evidence from the micro-simulation model suggests that they do in fact have a better chance of finding employment. Thus, even if inactive poor persons do decide to participate, their estimated employment probabilities are such that they will, on average, have little chance of ‘jumping the queue’ and finding employment before other poor active jobseekers.⁵⁶ From a

⁵⁶ Although a comparison of average employment probabilities cannot be considered proof that allowing participating among the inactive will alter poverty results, it is nevertheless useful to consider the evidence. The micro-simulation model shows that poor (i.e. those located in the four bottom household income deciles) active jobseekers have an average employment probability of 0.481 with a 95 per cent confidence interval of [0.476, 0.486]. This is significantly higher than the employment probability of inactive persons under the strict definition (this includes discouraged jobseekers), which is 0.447 [0.443, 0.450]. Even under the expanded definition of unemployment used in this study, the unemployed poor have a better chance of securing employment than the inactive, with an average employment probability of 0.465 [0.462, 0.469] compared to 0.448 [0.444, 0.452] for inactive persons.

consistency, economic and simplicity point of view the approach adopted here therefore seems justified.

a) Low-skilled Workers

The primary interface between the CGE and micro-simulation model is at the level of the labour market. Given differential treatment of different types of workers in the CGE model – an unemployment closure is assumed for low-skilled workers while skilled workers are fully employed – the macro-micro linkages for these two types of workers are also specified differently. As far as low-skilled workers are concerned, and in the absence of a module that permits changes in labour market participation, the first step in the micro-simulation model is to determine how the sector-specific low-skilled employment changes observed in the CGE model are likely to be allocated among individual labour market participants in the micro-simulation model.

Most micro-simulation models use predicted employment or unemployment probabilities to determine the distribution of job gains and losses. Such probabilities are obtained by estimating either a binominal employment-unemployment probit (or logit) model or a multinomial logit occupational choice model. In this study a multinomial logit approach is followed. This observations included in the estimation is restricted to all low-skilled labour market participants. All unemployed persons in the economy are assumed to also fall in this category, which is consistent with the assumption of full employment among skilled labour market participants. The dependent variable includes 23 discrete outcomes, i.e. participants can either be employed in any one of the 22 economic sectors found in the CGE model or they can be unemployed.

The independent variables include dummies for age, race, gender, location and education. Details of the construction of these dummy variables and the model output appear in the Appendix (see Appendix Table 3). The age variable plays an important role in capturing the employment experience of workers. As shown earlier in Chapter 2, the relationship between work experience and age is an important one, with limited experience among the youth offered as one of the major causes of unemployment among the youth. This is clearly reflected in the estimated coefficients. Race remains an important predictor of a person's unemployment probability, although as explained in Chapter 2, this variable stands proxy for a range of omitted variables, including the lower quality and effectiveness of schooling offered to African and Coloured labour market participants in particular. The race, gender, location and education variables are further important in that they help identify unique features of sectors as far as the characteristics of the workforce is concerned. This, as explained below, facilitates a more realistic job gain allocation outcome.

Once the econometric model is estimated, the probabilities of an individual being allocated to or ‘choosing’ any one of the 23 outcomes are predicted for each labour market participant. These unemployment and employment probabilities are used to allocate job losses among employed individuals or to identify jobseekers that have the ‘best fit’ for being employed in a particular sector.⁵⁷ Such a model is said to be probabilistic in the sense that the model does not identify a particular labour market outcome for each individual, but rather generates a probability distribution over all the possible labour market outcomes (see Herault, 2006).

The modelling framework developed here also incorporates further refinements, specifically with regards to targeting of individuals that are selected for hiring or firing. This is achieved in one of two ways: either predicted unemployment or employment probabilities are adjusted or weighted directly to influence outcomes, or the model is set up so as to select only certain labour market participants when allocating job gains or losses.

Since **minimum wages** are associated with net job losses among low-skilled workers, the focus is on the ‘firing processes’ in the model. Employment probabilities are therefore left unchanged, but unemployment probabilities that help identify those that are most likely to lose their jobs are multiplied by a factor that is proportional to the distance between a minimum wage worker’s existing wage and the minimum wage. Thus, as shown in equation [4.10] below, the new predicted unemployment probability (pr_u^*) is obtained by multiplying the originally estimated probability by the ratio of the minimum wage (w_M) to the wage (w).

$$pr_u^* = pr_u \cdot \frac{w_M}{w} \text{ if } w < w_M \quad [4.10]$$

As explained in more detail in Chapter 5, some workers employed in minimum wage sectors already earn more than the minimum wage (this is modelled as a new policy intervention and not as an increase in existing minimum wages), and hence the adjustment is only done for workers that initially earn less than the minimum wage ($w < w_M$). Targeting is also introduced by assuming that only those workers that are initially below the minimum wage can lose their jobs. Ultimately, the purpose of the weighting and targeting mechanism introduced here is to ensure that those workers that are initially further away from the minimum wage are more likely to lose their jobs than those that are just below the minimum wage. This loosely follows the approach in Hertz (2002), except for the fact that the initial set of probabilities are not random as was the case in Hertz’s study. This simulation is called the ‘non-random, weighted, targeted’ simulation and is treated as the benchmark simulation.

⁵⁷ For example, if the agricultural sector grows and increases its demand for labour, the model is more likely to predict an increase in demand for low-skilled (i.e. low levels of education) African and Coloured workers in rural (non-homeland) areas. Similarly, growth in demand for domestic workers will most likely translate into growth in demand for African or Coloured women in urban or metropolitan areas.

In order to illustrate the sensitivity of results to the assumptions about job gain/loss allocation rules, two additional sets of results are generated under alternative assumptions. The first does not apply the weighting factor, but still only targets workers that are below the minimum wage in the base. This is called the ‘non-random, non-weighted, targeted’ scenario. The second assumes job losses are completely random. Thus, the estimated unemployment probabilities from the multinomial logit model are ignored and replaced by a randomly generated probability (i.e. a value between 0 and 1). No weighting is applied and no targeting is assumed, which is tantamount to saying that any person currently employed in a declining sector is vulnerable to losing his or her job, irrespective of whether that person initially earned above or below the minimum wage. The expectation is that this simulation would most closely represent the outcome under the micro-incidence model. Results are reported in Chapter 5.

In the **wage subsidy** simulations the focus is on ‘hiring processes’. Various targeting mechanisms are introduced to allow for an evaluation of the outcome under alternative assumptions about how the policy might be implemented. No direct adjustments are made to employment probabilities as is the case in the minimum wage simulations. However, in order to be consistent with the way in which the simulations are formulated in the CGE model⁵⁸, only African, Coloured and Asian jobseekers are eligible for employment under this policy. A further set of simulations are conducted whereby beneficiaries may only be young jobseekers under the age of 35. This is consistent with calls for a youth-targeted wage subsidy policy (see Levinsohn, 2008).

Two important comments have to be made. The first concerns the approach followed in linking employment results between the two models. Usually the CGE models used in macro-micro applications have a fairly aggregated factor account structure, and hence employment results for each of these factors and in each sector (or groups of sectors; see Go et al., 2009) are linked to the micro-simulation model. In the case here there are too many factors and activities for which employment changes are observed in the CGE model to feasibly set up a multinomial logit model that can incorporate all these outcomes (48 low-skilled groups employed across 22 sectors). One option is to specify separate multinomial logit functions for different factor sub-groups. However, the approach adopted here is to link only the change in total low-skilled employment in each sector in the CGE to the micro-simulation model. This reduces the ‘prescriptiveness’ of the CGE model as far as employment gains for specific

⁵⁸ Chapter 6 provides details, but essentially, in terms of the factor targeting mechanisms devised, only low-skilled labour groups with an average wage at or below a certain threshold (R35 000) were included in the target group. This excluded all White factor groups, and hence in the micro-simulation model we also assume that no White unemployed persons would benefit (incidentally, Whites only make up 2.4 per cent of the broadly unemployed in any event).

types of workers is concerned by permitting the micro-simulation model to come up with a completely independent set of gainers and losers.

The second concerns the specific steps followed in identifying individuals for employment in growing sectors. Since sectors pick new employees from the same set of unemployed persons, and since the same individual could in theory be selected for employment in more than one sector, it is necessary to establish some 'pecking order' for firms. In reality it is quite unlikely that the same person would in fact be considered for employment by more than one employer given that the employment probabilities are designed to identify workers with the 'best fit'. Nevertheless, the simple rule followed here is that those sectors that offer the highest average low-skilled wage in the economy get to pick their preferred candidates first.

Once job losses and gains have been allocated, the second step in the micro-simulation model sequence is to adjust wage income levels of low-skilled workers affected by employment changes. Those that lose their jobs will now earn no income, while those that gain will earn a wage level predicted in a simple earnings function. The earnings function is a simple regression on wages earned and is estimated with the same set of independent variables as the multinomial logit model, except for the addition of sector dummy variables with 'unemployment' as reference case. The model is therefore also specified across all low-skilled labour market participants (i.e. unemployed and employed), and once an unemployed person is selected for employment his or her predicted wage is simply adjusted upwards by the coefficient obtained for the sector dummy associated with the industry in which that person has found employment.⁵⁹ Further details are provided in the Appendix (see Appendix Table 4).

Given the labour market closure for low-skilled workers, wages are fixed and hence no further links are necessary between the CGE and micro-simulation models as far as low-skilled workers are concerned. In the minimum wage simulations, however, an exogenous wage shock is explicitly modelled, and hence, in reality, the CGE model reports a change in low-skilled wages. However, these wage changes are only observed at a CGE factor group level, while it is possible to identify actual individual beneficiaries of minimum wage policies in the micro-survey data. Hence, for the minimum wage simulations only we adjust the wages of those low-skilled workers that initially earned below the minimum wage applicable to them upwards to the level of the minimum wage in a manner that is consistent with the initial

⁵⁹ One problem with using an earnings function in this manner is that random noise in the wage distribution is reduced, i.e. by assigning predicted wages to individuals the variance (and hence inequality) is reduced. One option is to add a randomly selected residual or error term from the sample to each predicted wage: the mean remains unchanged given the properties of the error term, but the noisiness is preserved. This is unlikely to affect poverty results, but does introduce some degree of randomness in results which makes it hard to replicate outcomes.

simulation shock in the CGE model. No such adjustments are required in the wage subsidy simulations.

b) Skilled Workers

The closure rule for skilled workers allows these workers to move between sectors, but overall skilled employment remains stable. This means the national average wage for skilled workers adjusts to ensure full employment. However, as workers move between different sectors their wage levels may also adjust to differences in average sector-specific wages. CGE models therefore define the activity-specific wage of factor f employed in activity a as the product $WF_f WFDIST_{f,a}$, where WF_f is the national average wage of that specific type of factor and $WFDIST_{f,a}$ is the ‘wage distortion factor’ that accounts for differences in average wages across sectors. Adjusting national average wages for specific factors in the micro-simulation model is straightforward. The only requirement is a mapping between individual skilled workers ($skill$) in the micro-simulation model and the relevant factor group ($SKILL$) in the CGE model, which is indeed available. Thus, for $skill \in SKILL$, a new skilled wage variable is generated in the micro-simulation model by simply applying the percentage changes in skilled wages observed in the CGE model to the individual reported wages in the survey data.

$$w_{skill}^* = w_{skill} (1 + \Delta w_{SKILL}) \quad [4.11]$$

An attempt was also made to replicate the inter-sectoral migration of skilled workers observed in the CGE model. This was done by assuming that skilled workers are released from contracting sectors and absorbed into growing sectors in much the same way as movements are predicted for unskilled workers, i.e. a multinomial logit model was used to estimate probabilities of hiring and firing. The only difference was that the model was only specified for skilled workers (i.e. no unemployment category), which meant that the same workers released from the contracting sectors were re-employed elsewhere, which is consistent with the full employment assumption in the CGE model. Once individuals that are involved in these inter-sectoral movements have been identified in the micro-simulation model, it would be possible to predict the changes in their wages emanating from these movements using an earnings function. However, while the job loss and allocation model produced good results, the application of the earnings function was less successful. As with the earnings function for low-skilled workers, the coefficients of sectoral dummies were used to estimate the change in a person’s wage as that person moved from one sector to another. Unfortunately, this approach invariably led to predicted wages below zero, and consequently these changes were conveniently ignored. This is tantamount to assuming that workers will earn the same wage when they move between sectors (although their wages may adjust as national average wages fluctuate due to demand conditions), which is not altogether

unrealistic. Although this simplification is a possible source of discrepancy between the micro-simulation and CGE models, it is probably insignificant given the small numbers of skilled workers that do in fact migrate between sectors in the scenarios modelled here.⁶⁰

c) Returns to Capital and Land

Returns to capital and land owned by households are two further factor income sources that are endogenous in the model. In the survey data (IES 2000) these incomes are reported jointly as gross operating surplus (GOS). However, following the approach in Pauw (2007), households in the micro-simulation model are divided into agricultural households and non-agricultural households. It is then further assumed that all GOS income reported by the former is linked to the ownership of agricultural land, while GOS income reported by non-agricultural households relates to returns to physical capital stock. These income sources are adjusted in accordance with the results in the CGE model for these two types of factors of production. In the equation below, ΔN and ΔK represent the percentage changes in the returns to land and capital as observed in the CGE model. These factors of production are not disaggregated, hence the lack of a subscript. Any household in the survey data that reports earnings from either of these two sources in the base will experience the same percentage increase in earnings from that income source, irrespective of the CGE household group that the household is attached to.⁶¹

$$GOS_h^* = N_h^* + K_h^* = N_h(1 + \Delta N) + K_h(1 + \Delta K) \quad [4.12]$$

d) Income Generation Function

The household income generation function is essentially an aggregation of factor incomes (skilled wages, unskilled wages, and returns to land and capital owned by the household) and exogenous incomes (Y_0) (mainly transfer income from government and remittance income). The equation below shows how the new (post-shock) household income value (Y_h^*) might be calculated. All skilled and unskilled wages earned by employed household members are added to form a household-level wage income variable. Skilled wages are derived as per equation [4.11], while low-skilled wages are estimated with the help of the earnings function or set to zero depending on whether jobs were gained or lost. Equation [4.12] shows how

⁶⁰ In the simulation considered the benchmark of the minimum wage simulations, about 10 000 skilled workers (5 per cent of the skilled workforce) migrate between sectors. In the benchmark wage subsidy simulation, migration amounts to about 13 500 workers. Clearly, these are not very large movements, especially when considered in the context of the large employment changes observed for low-skilled workers in these scenarios (see Chapter 5 and Chapter 6).

⁶¹ Incidentally, in the short run scenario capital stock is fixed within sectors (immobility) and hence the wage distortion factor, $WFDIST_{f,a}$ for capital is also fixed. Hence we do not have the same problems as with mobile skilled workers. $WFDIST_{f,a}$ is flexible under a long-run closure, but we only link the macro and micro results for the short run scenarios in this study. Land is always activity specific (only employed in agriculture) and hence $WFDIST_{f,a}$ for this factor is always fixed.

GOS income is obtained. Since Y_0 represents exogenous incomes, the real value of this variable is the same before and after the policy shock.

$$Y_h^* = \sum_f (w_{skill}^* + w_{lowsk}^*) + GOS_h^* + Y_0 \quad [4.13]$$

Since we wish to evaluate changes in per capita disposable income, some further adjustments are required. Taxes payable by households are calculated with the help of a new tax rate parameter, $ty_h^* = ty_h(1 + \Delta ty_H)$. Also, although income values are expressed in real terms, the model also accounts for changes in household-specific CPI values as observed in the CGE model and at a household group level. Finally, household disposable income is divided by the household size to yield a post-shock per capita disposable income variable. This can be compared against the base-level value in order to estimate changes in poverty and income distributions.

$$PCDISPY_h^* = Y_h^* (1 - ty_h^*) (1 + \Delta CPIH_H) / HHSIZE_h \quad [4.14]$$

In essence, the above equation is the same as the income generation function specified in equation [4.9] for the micro-incidence model, with the important difference being that the new household income variable is generated from a factor income perspective rather than through direct adjustment of household incomes.

5. Concluding Remarks

This chapter has established that partial equilibrium labour market models that are calibrated with micro-survey data allow for a very precise evaluation of poverty and distributional impacts of labour market shocks. However, when these models are also used to estimate wage and employment effects of different labour market policies, they are likely to under- or overestimate the true effects due to the fact that they do not account for indirect price and demand effects. Partial equilibrium labour market models are further unable to deal with cross-skill or cross-industry effects of labour market policy shocks.

For this reason it is proposed that a CGE model, given its superior setup in terms of the modelling of the factor market, is a preferred model framework for the evaluation of labour market policy shocks. CGE models further capture all the direct and indirect price and quantity relationships as well as linkages between various economic agents, all of which are potentially important in the evaluation of the net effects of labour market policies.

CGE models are, however, somewhat limited when it comes to the evaluation of poverty and distributional effects at the micro-level. This is due to the fact that the linkages between

factors of production and households are only specified at a representative group level, which means much of the within-group distributional information is lost.

For this reason, a desirable property of CGE models used for poverty analyses is highly disaggregated sets of factor and household groups. Micro-incidence or micro-simulation models linked sequentially to CGE models may also improve the quality of poverty and income distribution results substantially. Various options in this regard were explored in this chapter, while a detailed discussion of the particular models developed for this study was offered in the previous section. We next apply these proposed model frameworks to two labour market policy options, namely minimum wages and wage subsidies.

University of Cape Town

Chapter 5. Protection for the Working Poor: But do Minimum Wages Reduce Poverty?

In this first application chapter the impact of minimum wages on employment, household welfare and poverty levels is explored. This analysis is unique for two reasons. Firstly, it is the only analysis that explores the joint impact of all the minimum wages as defined by the sectoral determinations in South Africa. Previous analyses have focused only on the ‘main’ minimum wage sectors such as agriculture and domestic workers. Secondly, most analyses have been ex post or partial equilibrium ex ante analyses. This study adopts a general equilibrium ex ante approach and points out several indirect implications of minimum wage policies that were unaccounted for in previous analyses.

Section 1 provides the context for the analyses in this chapter by discussing some of the earlier research on this topic as well as the implementation of minimum wage policies in South Africa. Section 2 presents and discusses the results obtained from several sets of experiments or simulations of minimum wages. The experiments are set up by comparing actual wages earned prior to the introduction of minimum wages against minimum wage levels set by the authorities. Simulations are set up by assuming that employers comply with the minimum wage legislation and that all those workers who were initially earning below the minimum wage would now start earning the minimum wage. Since minimum wages raise production costs, employers respond by raising prices of their outputs and/or reducing employment levels. Their choices in this regard are governed by the production technology structure assumed for each industry as well as the demand-effects they face as an industry. Section 3 makes some brief closing statements, while more comprehensive conclusions are included in Chapter 7.

1. Minimum Wages in South Africa

1.1. Introductory Remarks and Literature Review

Chapter 3 provided a detailed theoretical review of minimum wages and how they are typically implemented. Various modelling frameworks for the evaluation of minimum wage impacts were described to illustrate the complexity of the relationship between minimum wages and poverty. It was concluded that poverty levels may be affected in at least three ways by minimum wages: some minimum wage workers will earn a higher wage, others may lose their jobs, and prices in the economy may increase which affects households' real disposable income levels. It was further argued that in order to properly assess these poverty effects, it is necessary to evaluate the policy impact in an economy-wide model that captures both the direct and indirect (or demand-side) effects of the policy. Also important is the wage-employment relationship, as encapsulated in the wage elasticity parameter, as well as income sharing in the household.

Analyses of minimum wage impacts are often ex post in nature, usually applying econometric techniques to evaluate wage employment relationships during a period in which minimum wages were introduced. The chosen method of analysis in this study is an ex ante framework. Hertz (2002:7) explains that an ex ante framework is useful in the context of minimum wage analyses as it “*solves the ceteris paribus problem that plagues econometric work*”. However, this comes at the expense of having to assume (as opposed to measure) changes in employment by imposing a certain wage elasticity level.

Domestic workers and farm workers represent two of the most vulnerable occupation groups in the South African economy. Consequently, the introduction of minimum wages for these groups of workers, in particular, generated a lot of interest from policy analysts. Prior to the implementation of the minimum wages, a number of studies were conducted to estimate the potential effects of these policies.

Bhorat (2000) performed simulations to explore the wage income and employment effects of notional increases in wages of domestic workers, farm workers and drivers. He concluded that the poverty-reducing effects of minimum wages were limited, and that it would require “*very large, and in policy terms highly unlikely, wage adjustments to ensure a tangible poverty reduction impact*”. He furthermore argued that employment losses that might arise from the policy would offset some of these gains (Bhorat, 2000:9). This particular study only accounted for first round effects of wage adjustments. It also applied the same percentage adjustment to every individual in a target group (as opposed to only adjusting wages of those that are initially below the minimum wage) and was not set up to allow for an evaluation of the net effects of wage income gains and employment losses in an integrated framework.

Given our interest in evaluating the poverty-reducing effects of actual minimum wages introduced in South Africa, the study by Hertz (2002) is perhaps a more appropriate point of reference (this model was discussed earlier in Chapter 3). In his model wages are raised to the level of the minimum wage, while the issue of the distribution of job losses among individuals is afforded explicit consideration. All of this is done within an integrated framework where income earned by individuals is pooled at the household level and redistributed among individual household members to study the poverty effects of minimum wages. As far as results are concerned, Hertz (2002) finds appreciable declines in poverty at low wage elasticity levels. Gains in both poverty and ultra poverty are, however, quickly eroded as the wage elasticity increases and employment losses erode income gains. In fact, poverty levels start rising once the wage elasticity increases beyond unity. An important contribution of Hertz's (2002) study is the notion that job losses are more likely to occur among those workers that are initially further away from the minimum wage. In an ex ante setup such an assumption has important implications for measurements of the depth of poverty.

The ex ante models of Borat (2000) and Hertz (2002) are both partial equilibrium approaches. As discussed and argued at length in Chapter 4, a general equilibrium approach may be required to properly capture the indirect effects of minimum wages, most important of which are the effects of minimum wages on prices, returns to other factors of production and indirect demand effects. This study therefore uses a CGE model as the primary method for analysing the economy-wide effects of minimum wages. CGE models are seldom applied in a minimum wage context, most probably due to the fact that these models make use of representative factor groups. When simulating the impact of the introduction of a new minimum wage policy it may be difficult to estimate the average wage change at a factor group level if the underlying survey data is not available or if the factor account is disaggregated in a manner that makes it hard to distinguish minimum wage workers from other workers in the economy.

The topic of minimum wages does, however, frequently come up in CGE analyses of trade liberalisation. Although *changes* in minimum wages are not necessarily modelled explicitly in such studies, the existence of minimum wages is used as a justification for modelling the market for formal (low-skilled) workers as 'rigid' (i.e., selecting an 'unemployment' closure with fixed wages). In one such application Decaluwe et al. (2000) illustrate how the welfare gains from trade liberalisation in Western African countries are reduced by up to 45 per cent due to labour market rigidities. Decaluwe et al. (2000) also cite several other studies that substantiate these types of results.

The application here explicitly explores the impact of a *new* minimum wage policy being introduced. Given access to the survey data that underpins the wage income information in the SAM it is possible to precisely calculate the minimum wage-induced average wage change that may be expected for each factor group employed across the economic sectors in the model. In many respects the modelling approach here is similar to that in Holland et al. (2006) in an application to Washington state in the United States.

However, an important and perhaps not so obvious difference between our simulations and those of Holland et al. (2006) is that they model the impact of an *increase* in an existing minimum wage rather than a new minimum wage policy. While from a technical point of view the modelling of these two types of policy shocks is exactly the same (i.e., the simulation shock involves raising wages of certain workers by a certain percentage), there are some practical considerations when the policy is an entirely new one. Appendix Figure 2 shows how the introduction of a new minimum wage policy might alter within-factor group wage income distributions. What is expected to happen when a new minimum wage is set is for the wage distribution to ‘bunch together’ at the level of the minimum wage as sub-minimum wage workers’ wages are raised to the level of the minimum wage. While this does indeed raise the average wage, it is also likely to reduce wage inequality, which violates the assumption in CGE models that within-group distributions are constant. Therefore, when such a wage shock is applied to the CGE model, the model will treat it as if the entire distribution shifts to the right without changing shape.

What often happens when minimum wages have been in place for some time is that wage annual increases for workers that initially earn more than the minimum wage are limited in an attempt to cross-subsidise mandated wage increases for sub-minimum wage workers. In the long run therefore, the bunching together of wages also happens from the upper-end of the distribution. Eventually the wage dispersion becomes small. When this minimum wage is adjusted (as opposed to a new minimum wage being implemented), it is plausible that the entire wage curve shifts to right without affecting the shape. The implication is that a CGE simulation of an increase in a minimum wage that has been in place for some time would yield more plausible distributional results.

South African minimum wages are set in terms several so-called sectoral determinations that govern employment conditions in various economic sectors. Sectors or occupation types that are afforded such explicit protection include (1) the retail sector, (2) domestic workers, (3) farm workers, (4) forestry workers, (5) taxi operators, (6) security personnel, (7) the hospitality industry, (8) contract cleaners, (9) people employed on learnership agreements, (10) children working in performance arts, and (11) the civil engineering sector. As discussed below in section 1.3, about one-third of workers in the economy are covered by these

minimum wages (the share is higher when excluding self-employed persons). A further 30 per cent of workers fall under the system of Bargaining Councils. These are joint employer and union bargaining institutions that deal with general disputes at the workplace, while also serving as a platform for the negotiation of conditions of employment, including minimum wage levels, hours of work, overtime, leave pay, notice periods, and retrenchment pay (see Bhorat et al., 2007a).

It is important to note upfront that the analyses in this study are only concerned with those minimum wages that are explicitly defined in terms of the sectoral determinations, and not those wage levels that are negotiated in Bargaining Councils on an annual basis. We therefore exclude large parts of manufacturing and community and social services sectors where wage bargaining does in fact take place. An important value addition in this study is that it considers the impact of eight of the eleven sectoral determinations, and not only those for farm and domestic workers, which has been the focus area of earlier studies.

1.2. South Africa's Minimum Wages

Most of South Africa's sectoral determinations were adopted between 2002 and 2006. Details of the prescriptions are published on the Department of Labour website.⁶² As noted, there are currently eleven sectoral determinations in force in South Africa. In these analyses, however, the sectoral determinations covering learnerships and children working in performance arts are excluded because these particular 'occupation groups' are not specified in the IES/LFS 2000, which is used as a basis for the CGE simulations and the micro-modelling. The civil engineering sectoral determination is also excluded due to the small sample size of civil engineering workers earning less than the minimum wage. Despite these exclusions, this study is still unique in that it is the first attempt at analysing the impact of the bulk of the minimum wages that are currently in force in a joint simulation and within an economy-wide, comprehensive modelling framework.

Table 5.1 provides details of minimum wage levels associated with the remaining eight sectoral determinations that are included in the analyses here. The sector of employment, occupation or skill level, firm size and the region of employment are generally the main factors determining whether a person is eligible for a minimum wage and also what the applicable level of the minimum wage is. With respect to the latter, minimum wages are typically higher in urban areas to compensate for higher transport and living costs. Up to five geographical areas are specified in each of the sectoral determinations, usually representing regions with different degrees of urbanisation (from A to E). This explains why several wage minima may exist within a particular sectoral determination. All the wage minima reported in

⁶² See http://www.labour.gov.za/programmes/programme_display.jsp?programme_id=2664.

the table are monthly wages converted to 2000 prices and are based on a standard 45-hour workweek.

Table 5.1: Minimum Wages Sectoral Determinations

Sectoral Determination	Occupation/Other Specifications	Area (*)	Monthly Minimum Wage (2000 prices)
Retail and Wholesale Trade	Managers	Area A	R 2,081
	Managers	Area B	R 1,678
	Managers	Area C	R 1,435
	Clerks	Area A	R 1,430
	Clerks	Area B	R 1,152
	Clerks	Area C	R 1,042
	Sales assistant	Area A	R 1,694
	Sales assistant	Area B	R 1,376
	Sales assistant	Area C	R 1,250
	Shop assistant	Area A	R 1,339
	Shop assistant	Area B	R 1,080
	Shop assistant	Area C	R 976
	Drivers	Area A	R 1,291
	Drivers	Area B	R 1,024
	Drivers	Area C	R 875
	Forklift operators	Area A	R 1,217
	Forklift operators	Area B	R 964
	Forklift operators	Area C	R 800
	Security guards	Area A	R 1,142
	Security guards	Area B	R 1,087
	Security guards	Area C	R 804
Domestic Workers	All Domestic Workers	Area A	R 727
	All Domestic Workers	Area B & C	R 590
Farm Workers	All Farm Workers	Area A	R 742
	All Farm Workers	Area B & C	R 660
Forestry Workers	All Forestry Workers	No region specified	R 624
Taxi Operators	Taxi Drivers	No region specified	R 1,055
	Taxi Fare collector	No region specified	R 1,055
Private Security Workers	All Security Workers	Area A (†)	R 1,439
	All Security Workers	Area B (†)	R 1,326
	All Security Workers	Area C (†)	R 1,197
	All Security Workers	Area D (†)	R 1,124
	All Security Workers	Area E (†)	R 1,001
Hospitality Sector Workers	Small firm employees	No region specified	R 1,105
	Medium to large firm employees	No region specified	R 1,231
Contract Cleaners	All Contract Cleaners	Area A (§)	R 1,305
	All Contract Cleaners	Area B (§)	R 1,176
	All Contract Cleaners	Area C (§)	R 1,047

Notes: (*) All areas labelled A, B and C are the same across the sectoral determinations, except: (†) the five private security workers regions, and (§) the three contract cleaner regions.

Source: Department of Labour website and author's own calculations. Mapping files are available from the author on request.

The security worker minimum wages deserves some closer attention. In reality, minimum wages are differentiated by the security officers' grade or qualification. Therefore, in addition to the five regions of employment, five grades are also distinguished (A to E). However, due to a lack of information in the IES/LFS 2000, it is impossible to determine the grades of

security workers in the dataset. Consequently, the minimum wage levels shown in Table 5.1 and used in this analysis for any security workers within a given region are those for grade C. We further assume that all security workers employed in the retail sector fall under the retail and wholesale trade sectoral determination.

1.3. Potential Wage and Employment Effects

In this section some general statistics are presented that will facilitate our understanding of the extent of the wage and employment effects of minimum wages as implemented in South Africa. The first step is to look at wage earnings prior to the implementation of minimum wages, as this will provide an indication, firstly, of which individuals might benefit from minimum wages and, secondly, what the extent of the wage gain will be, both for individuals and at a sectoral or household group level (see section 1.4). Wage and employment information in the IES/LFS 2000 provides a useful benchmark for the analyses here because the year 2000 represents a period prior to the introduction of any of the minimum wages currently in force in South Africa. A comparison of these wages with the minimum wages (converted to 2000 levels as per Table 5.1) that are applicable to specific workers⁶³ allows us to identify potential beneficiaries. These beneficiaries will include those workers earning less than the minimum wage that would eventually apply to them. Thus, once the sectoral determination comes into force they are set to earn a wage increase, provided of course their employers comply fully with the legislation and they keep their jobs.

Before continuing the discussion, it is necessary to clarify the terminology used. A *covered worker* is defined as any individual who is protected by a minimum wage in terms of the sectoral determination that governs conditions of employment in the sector of employment. *Uncovered workers* include the self-employed and people in sectors or in occupation types for which no minimum wage exists. Many of these workers fall under the system of Bargaining Councils. Given the definitions of covered workers, some covered workers may have already earned a wage equal to or above the minimum wage in 2000. These workers are classified in this study as *covered workers above the minimum wage*. In the simulations that we conduct later, their wages are assumed to remain unchanged once the minimum wage is introduced. Covered workers earning less than the minimum wage are referred to as *sub-minimum wage workers* in this study. In the comparative static analyses these workers' wages are adjusted to the level of the minimum wage.

Once the impact of minimum wages on individual wages is known, it is possible to calculate its impact on average wages, i.e. we can precisely calculate by how much factor- and sector-

⁶³ Such a comparison also requires that minimum wages are adjusted to reflect the average number of hours that an individual works.

specific average wages will increase. This, together with the wage elasticity of demand, will determine the employment loss in an ex ante model. The extent of the wage increase depends on at least three factors. Firstly, it depends on the share of workers in particular sector that are covered by minimum wages. We use the term *minimum wage coverage rate* to denote this share. A high coverage rate, however, still does not guarantee a large wage effect. Therefore, a second important consideration is the share of these covered workers that are below the minimum wage prior to its implementation. Finally, the average distance between the wages of sub-minimum wage workers and the minimum wage in each sector is also important. We consider these three factors in the following two sub-sections.

1.3.1. Sectoral Coverage Rates

Table 5.2 below shows the eight sectoral determinations identified for this study cross-tabulated against the main economic sectors in South Africa. Employment numbers and information on coverage is provided. The industry breakdown here, which corresponds to the sectors included in the CGE analyses conducted later, was governed to some extent by the sectoral determinations, i.e. care was taken to keep sectors for which a sectoral determination is in force separate from other industries in order to facilitate the analysis of the minimum wage impacts.⁶⁴ Some of the sectoral determinations, however, only cover certain types of workers or activities that form part of economic sectors in the CGE model that cannot be disaggregated further due to a lack of data.⁶⁵ Examples include the taxi industry (part of the transport sector), the contract cleaning sector (mainly part of community, social and personal services) and the security sector (mainly part of business and financial services). Coverage in these sectors is therefore automatically low.

Sectoral coverage rates are high in instances where the sectoral determination covers a large share of workers employed within an industry and there are relatively few self-employed workers. Thus, high coverage rates are found in the agricultural sector, the forestry sector and in private households (employers of domestic workers). In contrast, even though the retail and hospitality sectoral determinations cover all non-self-employed persons in the retail and wholesale trade and accommodation sectors respectively, the high share of self-employed workers in these sectors mean that overall coverage rates are low.

⁶⁴ The same set of sectors were also used in the wage subsidy analyses, mainly for simplicity reasons.

⁶⁵ The industry disaggregation is constrained by the industry disaggregation in the Supply and Use Tables (Statistics South Africa), as these form the basis of the supply and use information in the SAM on which the CGE model is based.

Table 5.2: Number of Workers by Sectoral Determination and Industry

Description	Retail sector	Domestic workers	Farm workers	Forestry workers	Taxi operators	Security personnel	Hospitality industry	Contract cleaning	Total covered workers	Self-employed	Other uncovered workers	Total uncovered workers	Total employment	Total sectoral coverage
Agriculture	-	-	741,506	-	-	-	-	-	741,506	165,130	-	165,130	906,636	81.8%
Forestry	-	-	-	68,573	-	-	-	-	68,573	1,869	-	1,869	70,442	97.3%
Fishing	-	-	-	-	-	-	-	-	-	3,313	12,572	15,885	15,885	0.0%
Minerals and mining	-	-	-	-	-	6,648	-	8,404	15,052	1,597	500,469	502,066	517,118	2.9%
Food products	-	-	-	-	-	1,071	-	4,693	5,764	10,992	202,343	213,335	219,099	2.6%
Beverages and tobacco	-	-	-	-	-	2,407	-	681	3,088	15,858	50,545	66,403	69,491	4.4%
Textiles	-	-	-	-	-	1,305	-	11,610	12,915	93,950	271,074	365,024	377,939	3.4%
Leather, wood and paper	-	-	-	-	-	865	-	2,747	3,612	21,197	147,831	169,028	172,640	2.1%
Petroleum	-	-	-	-	-	-	-	399	399	2,342	18,972	21,314	21,713	1.8%
Fertilisers and pesticides	-	-	-	-	-	-	-	438	438	1,385	41,906	43,291	43,729	1.0%
Pharmaceuticals & other chem.	-	-	-	-	-	-	-	535	535	495	13,723	14,218	14,753	3.6%
Non-metals	-	-	-	-	-	-	-	4,365	4,365	8,811	130,677	139,488	143,853	3.0%
Metals	-	-	-	-	-	-	-	4,213	4,213	18,992	192,597	211,589	215,802	2.0%
Machinery, equip. & other manuf.	-	-	-	-	-	984	-	12,809	13,793	18,553	219,293	237,846	251,639	5.5%
Electricity and water	-	-	-	-	-	1,135	-	4,099	5,234	1,242	71,986	73,228	78,462	6.7%
Construction and building	-	-	-	-	-	1,914	-	4,493	6,407	120,511	505,554	626,065	632,472	1.0%
Retail and wholesale trade	1,108,620	-	-	-	-	-	-	-	1,108,620	796,450	-	796,450	1,905,070	58.2%
Accommodation	-	-	-	-	-	-	239,858	-	239,858	123,055	-	123,055	362,913	66.1%
Transport and communication	-	-	-	-	94,855	10,376	-	2,327	107,558	73,094	343,720	416,814	524,372	20.5%
Financial and business services	-	-	-	-	-	159,688	-	79,136	238,824	76,823	544,894	621,717	860,541	27.8%
Government, social & other serv.	-	-	-	-	-	43,925	-	150,405	194,330	144,354	2,103,871	2,248,225	2,442,555	8.0%
Domestic services	-	1,001,394	191,923	-	-	1,498	-	5,585	1,200,400	9,031	-	9,031	1,209,431	99.3%
	1,108,620	1,001,394	933,429	68,573	94,855	231,816	239,858	296,939	3,975,484	1,709,044	5,372,027	7,081,071	11,056,555	36.0%

Note: The shaded cells represent the 'main sectors' associated with each sectoral determination.

Source: IES/LFS 2000

1.3.2. Sub-Minimum Wage Workers and the Wage Gap

In addition to the coverage rate, it was noted earlier that the extent of the wage increase will also depend on the share of covered workers below the minimum wage and on the average distance between reported wages and minimum wages among these sub-minimum wage workers. These two concepts are similar to what is referred to in poverty analysis as the ‘headcount ratio’ and the ‘poverty gap’ (i.e. P_0 and P_1 in the FGT poverty index. The FGT index can easily be modified to calculate the ‘sub-minimum wage headcount ratio’ and the ‘wage gap’. If this index is denoted by W_α the sub-minimum wage headcount ratio is calculated by setting $\alpha=0$ and the wage gap is obtained by setting $\alpha=1$. Another way of interpreting W_0 is to see this as the percentile in the initial wage distribution for a particular group of covered workers at which the minimum wage is set.

$$W_\alpha = \frac{1}{n} \sum_{i=1}^q \left(\frac{w_i^M - w_i}{w_i^M} \right)^\alpha \quad [5.1]$$

The index has a similar range to the FGT index. The symbol n in this equation represents the number of covered workers, q is the number of sub-minimum wage workers, w_i^M is the minimum wage and w_i is the actual reported wage of each worker prior to the introduction of minimum wages. An important distinction between the standard FGT index and W_α is the indexing of the minimum wage w_i^M over i (the poverty line (z) in the FGT index is a fixed value). Such indexing is required in the South African case because the minimum wage varies across sectors, occupation types, regions and so on. Monthly or annual minimum wages also depend on the number of hours people work, which means a different minimum wage may be applicable to each minimum wage worker. One solution is to simplify W_α by substituting $s_i = w_i/w_i^M$, thus yielding

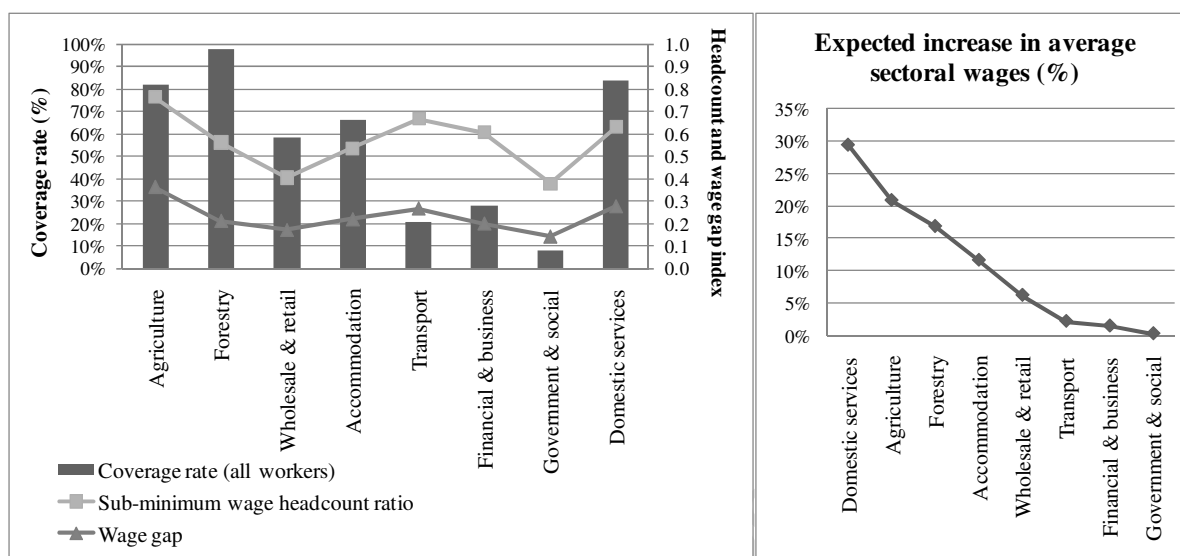
$$W_\alpha = \frac{1}{n} \sum_{i=1}^q (1 - s_i)^\alpha \quad [5.2]$$

This equation is now similar to the standard FGT index with a ‘normalized minimum wage’ of 1 and a ‘relative wage’ of s_i , where s_i is each worker’s wage expressed relative to the minimum wage.

Figure 5.1 shows the coverage rates (as per Table 5.2) for each of the eight ‘main sectors’ (see bar graph). Also shown are the sub-minimum headcount ratios (W_0) and the wage gaps (W_1) calculated for covered workers in each sector (line graphs, indexed on the right-hand axis). Estimates of W_0 range between 0.38 in government and social services and 0.76 in agriculture. These represent the shares of covered workers that are below the minimum wage.

W_0 and W_1 further tend to be correlated, with a higher W_0 often coinciding with a higher W_1 . The wage gap in agriculture is the highest (0.36), suggesting that farm worker wages are, on average, furthest away from their respective minimum wages. This is followed by domestic services (0.28) and the transport (0.27), both of which have similar levels of W_1 .

Figure 5.1: Coverage, Headcounts, Wage Gaps and Wage Increases by Economic Sector



Source: IES/LFS 2000 and author's own calculations

Given the above observations, coupled with the fact that coverage rates are high in agriculture and domestic services, the expectation is that wage increases associated with the implementation of minimum wages will be highest in these sectors (assuming full compliance and no job losses initially). This is confirmed by the graph in the right-hand panel of Figure 5.1, which shows the average expected wage increase across *all* workers employed in sectors (compare Table 5.3 further below). Despite a high W_0 and W_1 , wages in the transport sector only rise marginally, which reflects the fact that the sectoral determination for taxi operators only covers a small percentage of workers in the larger transport sector. These results indicate the importance of all three the observed variables – coverage rate, the sub-minimum wage headcount ratio and the wage gap – in determining the extent of the increase in the average sectoral wage in response to minimum wages. These wage change will play a crucial role in determining the extent of the employment loss associated with minimum wages at a given wage elasticity level.

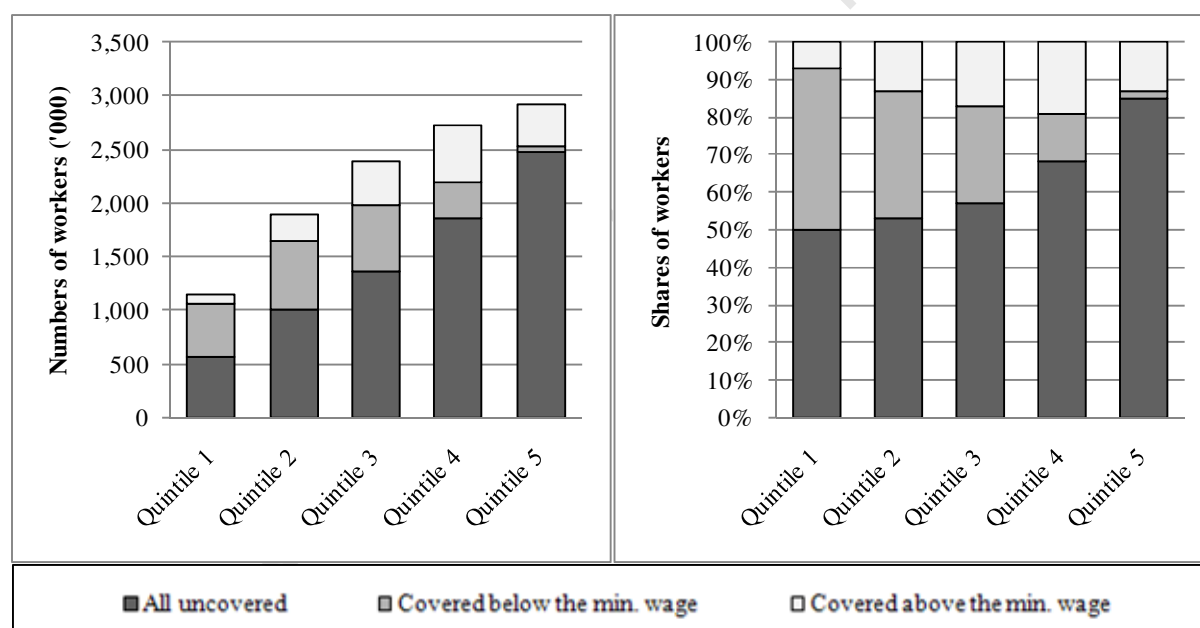
1.4. Potential Household Income and Poverty Effects

The objective of the CGE analyses is to evaluate the poverty and distributional effects of minimum wages, and hence it is also instructive to briefly consider some of the linkages that exist between poor households and sub-minimum wage workers. Results presented earlier in Chapter 2 showed that relatively poorer households in South Africa have fewer income

earners and are larger in size. The poor are therefore generally less reliant on wage income as a source of income, which means they are also less exposed to changes in wages or employment levels. Of real interest, however, is the distribution of sub-minimum wage workers across different household income groups as they are ultimately the potential beneficiaries of the policy.

The left-hand panel of Figure 5.2 shows the distribution, in absolute terms, of covered workers below and above the minimum wage as well as uncovered workers across household income quintiles. Sub-minimum wage workers are distributed fairly evenly across the bottom three quintiles (500 000 to 600 000 workers in each group). There are about half as many in quintile four, and virtually no sub-minimum wage workers in the richest quintile. On aggregate, though, there are roughly equal numbers of non-poor (top three quintiles) and poor (bottom two quintiles) sub-minimum wage workers (approximately 1 and 1.1 million respectively).

Figure 5.2: Number and Share of Workers According to Minimum Wage Classification

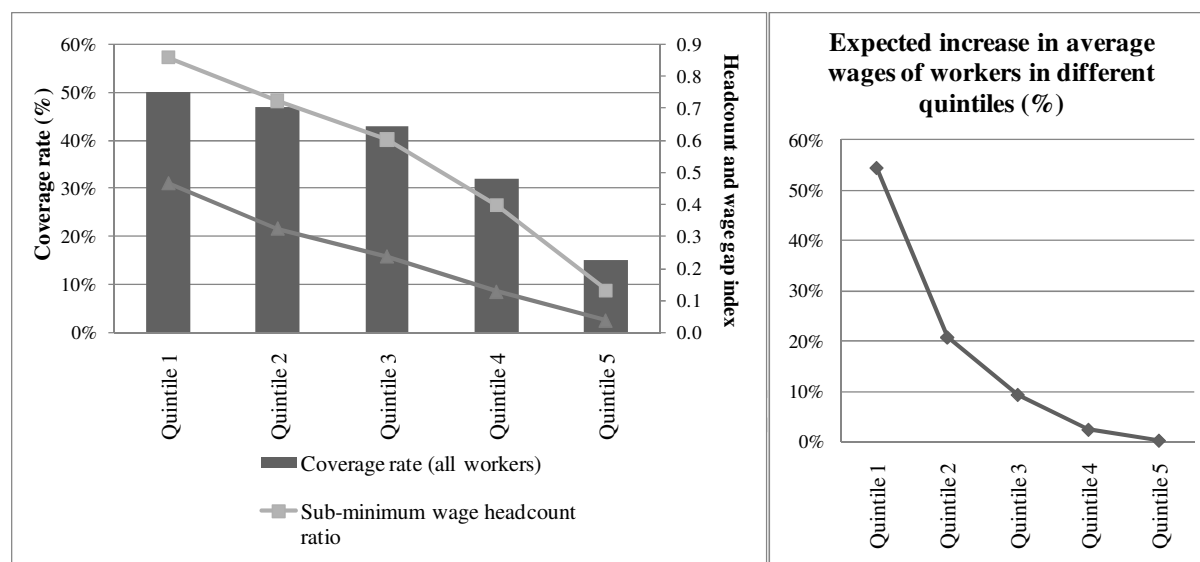


Source: IES/LFS 2000

Although in absolute terms one may be tempted to say that minimum wage legislation will impact equally on poor and non-poor households, several other factors need to be considered as well. The right-hand panel of Figure 5.2 shows that about 50 per cent of workers in quintile one and 47 per cent in quintile two are covered by minimum wage legislation. Very large shares of these workers are in fact sub-minimum wage workers, as is clear from the figure. In contrast, only a small percentage of non-poor workers are covered, and even fewer of these are sub-minimum wage workers.

These shares imply that the sub-minimum wage headcount ratio (W_0) in the poor quintiles is much higher than in non-poor quintiles. Evidence of this is presented in Figure 5.3, where ratios of 0.86 and 0.72 are calculated for W_0 in the two poor quintiles (indexed on the right-hand axis). Also shown in the figure is the wage gap (W_1), which is also much higher in the poorer quintiles. This wage gap is evidence that poor workers are, on average, further away from the minimum wage.

Figure 5.3: Coverage, Headcounts, Wage Gaps and Wage Increases by Household Quintiles



Source: IES/LFS 2000 and author's own calculations

The combination of higher coverage rates, sub-minimum wage headcount ratios and wage gaps in the poor quintiles are all indicative of the fact that poor workers are set to experience larger wage increases than their non-poor counterparts once minimum wages are introduced. This is clearly shown in the right-hand panel of Figure 5.3, which shows the expected percentage increase in average wages earned by *all* workers across different quintiles. Workers in the poorest quintile will, on average, experience wage increases of 54.4 per cent, compared to 20.6 per cent in quintile two. In contrast those in the non-poor quintiles will only experience increases of about 10 per cent and below. Of course, when the policy shock is implemented in the CGE model, the average wage increase will be specified across sectors and for different factor groups (see Figure 5.1 earlier and Table 5.3) and not across quintiles. This means the distributional information generated in the CGE model may not look exactly like this.

Even in absolute terms the increases earned by poor workers are large compared to those of non-poor workers. The percentage increases shown in Figure 5.3 are equivalent to absolute annual wage increases of about R2 454 for workers in quintile one, R1 821 in quintile two, R1 333 in quintile three, R612 in quintile four and R74 in quintile five. However, in order to truly understand the potential poverty effect it is necessary to consider household structures,

as wage increases are ultimately shared among several household members. Data from the IES/LFS 2000 suggests that poor sub-minimum wage workers live in households with an average of 5.5 members. The comparative figure for non-poor sub-minimum wage households is 3.1 members. This means the minimum wage-induced income gains earned by poor workers are shared among almost twice as many people, which puts the potential poverty-reducing effects of minimum wages into perspective.

The analyses so far are preliminary and exploratory in the sense that we have not taken into account job losses that might result from minimum wages. Job losses, however small, will erode income gains associated with minimum wages. From a poverty and distributional point of view it is therefore important to consider how such job losses might be distributed among individuals and where these individuals are located in the welfare spectrum. Only once this distribution is known can the net effects of minimum wages be estimated. We next turn to an economy-wide modelling framework that will allow for such an integrated analysis.

2. Economy-Wide Analysis

2.1. Description of the Simulations

Technical details of the CGE model and the micro-incidence and micro-simulation models were provided in Chapter 4. To recap, a highly disaggregated CGE model is used as the primary analysis tool. Economy-wide results on employment changes, factor income changes and household income changes are generated in this model. Two micro-level models are then specified to aid the analysis of poverty and distributional effects of minimum wage policies. These include a micro-incidence model whereby percentage changes in average income levels of household groups in the CGE model are linked to individual households in the micro-model, as well as a micro-simulation model where the primary interface is between factor groups in the CGE model and individual workers in the micro-model.

All the simulations conducted model the same wage shock as calculated for each representative factor group employed in each sector in the CGE model. The aim is to explore the impact of a *given* minimum wage policy under different assumptions about firm behaviour and labour market responses to minimum wage policies rather than to explore outcomes under different minimum wage policy scenarios. Given uncertainty around the wage-employment relationship, one of the primary goals is in fact to evaluate the impact of minimum wages for different wage elasticity levels. We also evaluate the impact of minimum wages for different levels of labour productivity gains in order to test whether outcomes are improved under an efficiency wage scenario where increased wages induce higher productivity among workers. These simulations are conducted under both a short- and long run scenario.

A further important feature of the simulations is the assumption that employers across *both* formal and informal⁶⁶ sectors fully comply with the legislation. Although full compliance (especially in the informal sector) is perhaps unlikely, the aim here is to simulate the policy as it is intended to operate (see section 2.1.3)

2.1.1. Minimum Wage Shock

The simulated wage shock is calculated directly from the IES/LFS 2000 data. This is possible because a direct mapping exists between the factor and activity groups in the SAM and individual workers in the IES/LFS 2000 data. Thus, average wage changes for all factor groups employed across all sectors can be calculated by comparing the reported wage levels against the wage level that workers would be earning once the minimum wage is implemented, assuming that employers fully comply with the minimum wage regulations. The wage change, as explained, only applies to sub-minimum wage workers, while all other workers' wages remain constant. These changes (in percentage terms) are then applied to the relevant factors and activities in the CGE model as part of the simulation shock.

There are 88 labour groups in the SAM. Although the wage change is calculated for all of these factor groups, it is technically speaking only those factor groups that are classified under an unemployment closure for which wage changes can be applied exogenously in the simulation shock. In this model this includes all unskilled and medium skilled workers (low-skilled). High-skilled wages are flexible in terms of the full employment model closure, i.e. even if wage changes are applied for these workers in the simulation, their wages will simply revert back to the equilibrium level in the base once the model is solved. In reality, about 2 per cent of workers classified as high-skilled workers are in fact sub-minimum wage workers (IES/LFS 2000), but this is more than likely a reporting error. Skilled wage changes are therefore effectively ignored in the simulations.

It is important to note that since the CPI is the numéraire in the model and since low-skilled wages are fixed in terms of the unemployment closure, low-skilled wages are also fixed in real terms. By extension, the wage changes simulated are real changes, i.e. income gains associated with the minimum wage policy are, by construction, not eroded fully by inflation. This is consistent with the fact that minimum wage levels are revised regularly by the Department of Labour to keep pace with inflation.

Table 5.3 shows the average wage changes in different sectors for different types of workers in the CGE model. The shaded column shows the average wage shock implemented for low-skilled workers (the actual simulation shock is disaggregated across the low-skilled factor

⁶⁶ The identification of the formal/informal sectors is based on a question in the LFS September 2000 that asks whether the business in which the respondent is employed is in the formal or informal sector.

groups). Skilled workers, as explained, are fully employed and are assumed to be unaffected by the minimum wage. The last column (sectoral average) shows the effective change in the total wage bill experienced by each sector (compare Figure 5.1). It is clear to see that the agriculture, forestry and accommodation sectors will be hardest hit by minimum wages. The relative size of the agricultural and domestic worker sectors further imply that most of the job losses that result will occur within these two sectors.

Table 5.3: Simulated Average Wage Changes by Sector

	Unskilled wages	Medium-skilled wages	All low-skilled wages	Sectoral average
<i>Main minimum wage sectors</i>				
Agriculture	55.7%	8.1%	24.1%	20.9%
Forestry	33.8%	9.3%	19.3%	16.9%
Retail and wholesale trade	15.0%	9.7%	11.0%	6.3%
Accommodation	35.4%	18.2%	20.7%	11.7%
Transport and communication	2.8%	5.8%	5.5%	2.3%
Financial and business services	12.2%	6.9%	7.6%	1.6%
Government, social and other services	4.1%	0.3%	1.1%	0.4%
Domestic services	32.8%	1.7%	29.4%	29.4%
<i>Other Sectors</i>	1.6%	0.1%	0.4%	0.2%
All sectors	16.2%	3.6%	6.5%	3.1%

Note: The sectoral average (last column) takes into account the entire wage bill, i.e. also high-skilled wages, which are unaffected by minimum wage legislation.

Source: IES/LFS 2000 and author's own calculations.

The minimum wage in the government, social and other services sector needs some clarification. Although the effective wage increase is small (0.4 per cent), the government sector is not traditionally thought of as a sector where employment is governed by a production function or where it responds to relative wage changes. As shown in Table 5.2, however, this sector (or more correctly the 'other services' part of it) includes some security workers and contract cleaners that are covered by minimum wage legislation. It is therefore necessary to assume that the entire sector operates like any other profit-maximising sector, even if this is not entirely consistent with what we know about the government part of the sector.

2.1.2. Simulation Loops

Two sets of simulations are conducted. The first simulation set explores the general equilibrium effects of the minimum wage shock across a range of different sector-specific wage elasticity levels. Results are reported for national weighted (or aggregate) wage elasticity values (shown in absolute terms here) of $\eta = 0.3$, $\eta = 0.5$, $\eta = 0.7$, $\eta = 1.0$ and $\eta = 2.0$, where $\eta = 0.7$ represents the benchmark elasticity value. Section 3.3 in the Appendix provides a detailed explanation of how sector-specific elasticity of substitution values that

correspond to these specific national weighted wage elasticities, are estimated. These same elasticity values are also applied in the wage subsidy simulations.

A second simulation set explores the impact of increased labour productivity under an ‘efficiency wage’ scenario. Nutritional factors, lower labour turnover and better firm management may all contribute to rising labour productivity. Although there is little evidence linking minimum wages to productivity gains in South Africa, Hertz (2002:3) argues that this may be more than “*an academic possibility for farm and domestic workers*” in South Africa given low wages and poor labour relations. In running these simulations we do not imply to claim that productivity gains are a strong possibility; the simulations merely illustrate the obvious gains that may materialise when labour does in fact become more productive in response to minimum wages.

The same minimum wage shock as before is modelled, but unskilled workers are now assumed to become more productive in response to earning a higher wage. All the productivity simulations are run at a wage elasticity of $\eta = 0.7$. The productivity gain is modelled by assuming that factor-specific gains are directly proportional to the wage change experienced by that factor. In short, the first simulation in this set assumes no labour productivity increase. In the second through to the fifth simulations, labour productivity increases by a factor of 0.25, 0.50, 0.75, 1.0 and 1.25 of the percentage increase in the wage for low-skilled workers in each sector.⁶⁷

Pauw et al. (2007b) provide a detailed description of the different ways in which productivity changes can be modelled in CGE models and at various levels in the nested production structure. In the analyses here labour productivity gains are simply modelled as a direct increase in the marginal product of workers. Unfortunately the use of representative factor groups (rather than individual factors) in a CGE model makes it impossible to isolate sub-minimum wage workers from uncovered workers or covered workers above the minimum wage. Therefore, all members in a particular group effectively experience the same change in productivity, irrespective of whether that person is a sub-minimum wage worker or what the individual’s wage gap was prior to the introduction of the minimum wage.

Both the ‘no labour productivity’ and the ‘labour productivity’ simulation sets are conducted under a short run and long run scenario. These scenarios basically imply different treatments of capital stock in the model as defined in terms of the closure rules. As explained in the Appendix (section 2.1.3) capital stock is activity specific and fixed in the short run and mobile across sectors in the long run.

⁶⁷ For example, if the wage of an unskilled worker in a certain industry increases by 10 per cent, the productivity increase in the six simulations run here will be zero, 2.5, 5.0, 7.5, 10.0 and 12.5 per cent.

2.1.3. What is not modelled?

There are several additional scenarios that could have been explored. The first is a consideration of outcomes under a ‘less-than-full’ compliance scenario. In theory, all workers in the economy across both formal and informal sectors are covered by minimum wage legislation. However, enforcement in informal sectors, smaller firms or households may be especially difficult. Hertz (2005), for example, finds evidence of substantial non-compliance with minimum wage provisions for domestic workers in South Africa, a sector that is largely informal. This suggests that the scenarios here are quite optimistic as far as the coverage of minimum wages is concerned.

Using a partial equilibrium model, (Pauw et al., 2008a) compare poverty effects of minimum wages under a full and low compliance scenario. In the latter scenario, full compliance was assumed for the formal sector, but informal wages were left unchanged. Such lower compliance will mean a lower effective wage increase but also lower employment losses, which makes the implications for poverty uncertain. The authors find that a higher level of compliance results in an improved poverty effect, which reflects the fact that wages are generally lower in those sectors where employers are less likely to comply with minimum wage legislation (i.e., informal sectors). A similar analysis was considered beyond the scope of this study.

This study also does not consider the sensitivity of outcomes to different household income and price elasticity levels. We argue throughout that the indirect demand effects of minimum wages are important given the policy’s impact on household incomes and prices. However, the extent to which indirect demand effects are important also depends on the sensitivity of consumption demand to changes in income and relative prices, i.e. the income and price elasticities are key parameters. The primary focus in this study, however, is to show how sensitive model outcomes are to different wage elasticity levels. The addition of extra layers of sensitivity tests will make the analysis convoluted; hence, all simulations are conducted using the same set of demand-side elasticities, and particularly those used by PROVIDE, (2005).

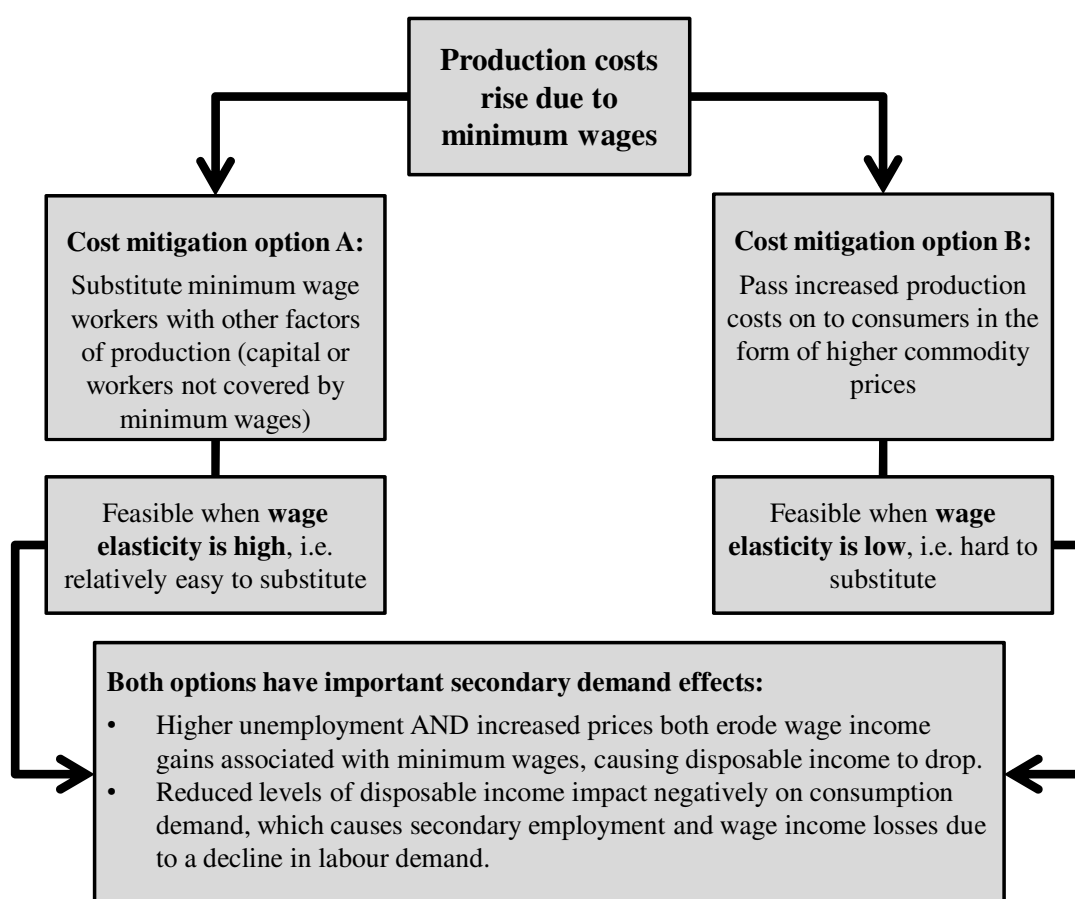
2.2. Interpretation of Results: Firms’ Responses to Minimum Wages

Before continuing with a discussion of the results, it is useful to consider how, in a general equilibrium context, firms might respond to minimum wages under certain conditions. This brief discussion will aid the interpretation of results later. When faced with minimum wages, firms incur production cost increases. They essentially have two options available to them to mitigate these cost increases, i.e. they can either reduce the employment of minimum wage workers by substituting them for other factors of production, or they can absorb the cost

increases and pass these on to consumers in the form of higher prices.⁶⁸ Figure 5.4 shows these cost mitigation options in a diagram.

In practice firms will opt for a combination of the two cost mitigation options, with wage elasticity of labour demand determining the optimal choice. When the wage elasticity is high, substitution along the production isoquant is easy, and firms would lean towards substituting minimum wage workers with other factors of production (option A). If, however, the wage elasticity is low, substitution possibilities are limited and firms are forced to raise consumer prices by more than would have been necessary under a high wage elasticity scenario. For average elasticity levels both cost mitigation options will be used, which means that both employment and price effects will be moderate.

Figure 5.4: Cost Mitigation Options: How do Firms Respond to Minimum Wages?



Standard labour market partial equilibrium models only consider the substitution effects of minimum wage policies, and then only partially, i.e. only employment levels of minimum wage workers are considered. This means only the implication of cost mitigation A are

⁶⁸ A third possibility, but one that cannot be explored in a model with perfectly competitive markets, is that some firms may choose absorb cost increases, but rather than raising prices, they reduce profits in an attempt to protect their market share.

explored, without considering the impact on prices. The tendency for firms to lean towards cost mitigation option B under a low wage elasticity scenario is therefore ignored. CGE models, on the other hand, allow for the exploration of both substitution and price effects. Both these have important downstream effects as explained in the box at the bottom of Figure 5.4.

2.3. Results and Analysis

Minimum wages have been in place in South Africa for some years now, and already labour force data is available that allows for an ex post analysis of their impact, at least as far as employment effects are concerned. Some may argue that using actual observed data provides a much better indication of the true impact of minimum wages in South Africa than an ex ante analysis could. Ex ante modelling of a policy that is already in place is precarious indeed. The temptation will always exist to compare the results generated in such an ex ante model against actual data, and invariably the modelled results will look different from those observed in reality.

It is important, however, to remind ourselves that comparative static models are not predictive tools. They do not account for long-term dynamic changes, such as sectoral growth or decline over time, changes in household size or structure, population growth, investment responses or economic growth. They also do not account for any other exogenous shocks, be they internal policy changes or external economic shocks. It is therefore almost expected that the economy today looks different to the economy represented by the counterfactual data produced in the general equilibrium and micro-level models here.⁶⁹ Rather, these models are policy tools that are useful for evaluating the impact of policy shocks under specific assumptions about how agents in the economy interact and respond to shocks. Such analyses aid the exploration of possible scenarios and hence improve our understanding of economic linkages and behaviour.

⁶⁹ Examples in the South African context where we can almost expect the CGE results to differ from observed outcomes include: (1) The long-term decline in employment in agriculture in South Africa may relate to technological changes in production, structural shifts in production and minimum wages; hence modelled outcomes here may underestimate observed employment changes in this sector. (2) The retail and wholesale and retail trade sector experienced strong employment growth after 2000. Cost increases associated with minimum wages in this sector could well have been mitigated by cheaper imports, which also sparked a consumer boom and hence increased demand for workers in this sector. (3) Despite expectations that domestic worker minimum wages would lead to a large decline in employment in this sector, South African households have also become smaller and more fragmented, while more families now rely on two incomes for support. These factors have increased the demand for domestic services at home despite the introduction of minimum wages.

2.3.1. Employment and Production Effects

When interpreting employment and wage results for different types of factors of production it is important to bear in mind the factor market closures selected. To recap, all labour categories are assumed to be fully mobile across sectors in both the short run and long run scenarios. Skilled workers are fully employed at the national level, but sectoral employment of skilled workers may vary depending on demand and supply conditions within sectors. Unskilled workers, on the other hand, face constant wages (unless changed exogenously, e.g. in the minimum wage simulation) and flexible employment levels both at a sectoral and national level, reflecting the ‘excess supply’ or unemployment that exists among unskilled workers in South Africa. It is also useful to bear in mind that the employment losses associated with the minimum wage simulations are probably upper bound estimates at any given wage elasticity level given the assumption of full compliance by employers across both formal and informal sectors.

a) Low-Skilled and Skilled Employment in the Short Run

Table 5.4 presents employment results for low-skilled and skilled workers in the main minimum wage sectors. Overall, 4.2 per cent of the 8.7 million low-skilled workers lose their jobs in the low-elasticity scenario ($\eta = 0.3$). This figure rises to 5.2 per cent when $\eta = 0.7$, the benchmark wage elasticity. At a very high wage elasticity ($\eta = 2.0$) job losses can be expected to be around 678 000 or 7.8 per cent of low-skilled employment in 2000. The benchmark scenario translates to a decline of 4.1 per cent in overall employment (there were just over 11 million workers employed in the base) and an increase in the unemployment rate (broad definition) from 37.1 to 38.6 per cent.

In absolute terms domestic workers suffer the greatest employment decline, with losses accounting for almost three-quarters (289 213) of the 363 049 low-skilled jobs lost in the economy under the low-elasticity scenario ($\eta = 0.3$). The other major contributors to job losses are the agriculture, retail and wholesale trade and accommodation (hospitality) sectors. The large number of job losses among domestic workers is unsurprising given that this is a relatively large sector with a high minimum wage coverage rate. The simulated wage change for domestic workers is also the largest of all the sectors. Interestingly, however, domestic worker job losses appear to be fairly insensitive to the wage elasticity, with job losses remaining in the region of 290 000 even as the wage elasticity value approaches $\eta = 1.0$. At this wage elasticity level, domestic sector job losses ‘only’ account for 50 per cent of overall job losses, which implies that increases in job losses in other minimum wage sectors have risen relatively faster than in the domestic workers sector.

Table 5.4: Employment Results: Short and Long Run Scenarios (No Labour Productivity Gains)

	Short run					Long run				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Low-skilled employment by sector										
Agriculture	-23,783	-35,911	-46,902	-61,055	-95,626	-60,914	-72,340	-80,198	-88,491	-105,442
Forestry	-544	-879	-1,223	-1,731	-3,351	-2,276	-2,392	-2,556	-2,834	-3,823
Retail and wholesale trade	-27,756	-42,265	-54,842	-71,222	-114,039	-57,812	-64,705	-71,305	-81,015	-112,593
Accommodation	-9,637	-14,938	-19,597	-25,670	-40,968	-34,129	-36,177	-37,761	-39,845	-46,043
Transport and communication	-1,709	-2,942	-4,254	-6,338	-13,908	118	-1,504	-3,267	-6,003	-15,211
Financial and business services	-1,994	-3,622	-5,419	-8,329	-18,930	-1,030	-3,171	-5,392	-8,762	-19,888
Government, social and other services	-3,682	-8,018	-13,031	-21,169	-49,845	-1,445	-7,380	-13,540	-22,914	-54,161
Domestic services	-289,213	-290,315	-291,328	-292,714	-296,715	-294,846	-294,883	-295,334	-296,215	-299,467
Other Sectors	-4,731	-8,249	-12,395	-19,228	-45,024	21,722	14,844	7,223	-4,527	-43,909
Net change	-363,049	-407,139	-448,991	-507,457	-678,407	-430,611	-467,706	-502,130	-550,606	-700,539
<i>Percentage change in overall low-skilled employment</i>	<i>-4.2%</i>	<i>-4.7%</i>	<i>-5.2%</i>	<i>-5.9%</i>	<i>-7.8%</i>	<i>-5.0%</i>	<i>-5.4%</i>	<i>-5.8%</i>	<i>-6.4%</i>	<i>-8.1%</i>
Skilled employment by sector										
Agriculture	-624	-931	-1,202	-1,539	-2,286	-1,742	-2,034	-2,212	-2,370	-2,567
Forestry	-7	-12	-16	-21	-39	-47	-46	-46	-46	-48
Retail and wholesale trade	-3,658	-5,204	-6,337	-7,522	-9,149	-9,190	-9,129	-9,008	-8,786	-7,966
Accommodation	-1,552	-2,363	-3,050	-3,904	-5,819	-6,521	-6,687	-6,757	-6,801	-6,810
Transport and communication	296	496	674	897	1,323	1,406	1,452	1,445	1,397	1,144
Financial and business services	911	1,261	1,434	1,439	137	3,149	2,909	2,582	2,037	125
Government, social and other services	3,373	4,718	5,718	6,873	9,531	6,316	6,766	7,119	7,584	8,935
Domestic services	-163	-162	-161	-160	-155	-165	-164	-163	-161	-156
Other Sectors	1,425	2,198	2,940	3,936	6,456	6,796	6,933	7,039	7,146	7,343
Net change	0	0	0	0	0	0	0	0	0	0

Note: Results from the 'with labour productivity gains' short run scenario is shown in Appendix Table 7.

Source: CGE/micro-model results

The domestic worker sector is unique in that no capital is employed in the production process, while virtually all domestic workers are low-skilled workers. This rigid employment structure means that there are no substitution possibilities available to employers, irrespective of the wage elasticity levels assumed for the sector. Production cost increases are therefore absorbed by employers and passed on to 'consumers', which in the case of domestic workers are the employers themselves. These consumers then respond to price increases by demanding less of the service, hence the employment effect is determined almost entirely by the price elasticity of demand and not by the elasticity of substitution in the production function.

Scenarios considering different consumption demand responses are considered to be beyond the scope of this study as noted, but it is an interesting issue. Hertz (2002) notes that while domestic services can be considered a luxury or non-necessity, it is also relatively inexpensive in South Africa. Many households, he adds, have over a long period of time become accustomed to having hired help at home. He cites studies that suggest that domestic worker job losses might initially be large once the minimum wage is introduced, but this may be followed by a wave of re-hiring as people tire of the extra housework. The ultimate employment effect may therefore be smaller than what our model suggests. Such an outcome could be illustrated by running the scenarios at lower price elasticity for domestic services.

Net job losses among skilled workers are zero by construction, with wages adjusting to ensure full employment at an economy-wide level. However, sectoral employment of skilled workers may vary as skilled workers are attracted to expanding sectors. As unskilled labour becomes relatively more expensive due to the introduction of minimum wages, their skilled counterparts will be relatively more attractive to employers. In the interim period, therefore, a *substitution effect* takes place along the value added production isoquant, with more skilled workers demanded relative to low-skilled workers. This will result in a decline in low-skilled employment and an increase in skilled employment at a sectoral level.

However, a *scale effect* may also be observed. Since low-skilled wages rise exogenously in the minimum wage simulations, overall employment costs increase, thus causing production costs and consumer prices to increase. This leads to a decline in demand for output from minimum wage sectors, which may cause the demand for all types of labour to decline in those sectors. The results presented in Table 5.4 suggest that these scale effects dominate; skilled employment declines in most of the minimum wage sectors. Further evidence of a decline in aggregate demand for skilled labour in the economy is presented further below when changes in factor incomes are considered (economy-wide average skilled wages decline). These results illustrate the importance of considering prices and indirect demand effects when evaluating the net welfare effects of policy shocks.

b) Low-Skilled and Skilled Employment in the Long Run

The short and long run scenarios differ only in terms of the assumption about whether capital is fixed at a sectoral level (short run) or mobile across sectors (long run). Greater flexibility in the long run allows contracting sectors to shed capital stock, which is then re-employed elsewhere. Substitution between capital and labour is still governed by relative prices of these factors, but the effect of a reduction in capital stock is that overall labour input requirements are lowered. Ultimately, this causes the employment response to minimum wages to be larger in the long run than in the short run. This is consistent with evidence that long run wage elasticities tend to exceed short run wage elasticities. However, in a CGE modelling context it is not wage elasticities (or elasticities of substitution) themselves that increase in the long run (these model parameters remain unchanged); it is merely the economy that develops the ability to undergo structural shifts in the longer run as far as sectoral production capacities and output levels are concerned. Sectoral production effects are considered in more detail below.

c) Factor Incomes

Table 5.5 presents results on real changes in total factor income. Factor incomes shown here are expressed in real terms, i.e. wage changes are expressed relative to the CPI, which is the numéraire in the model. In the case of labour, total factor income is simply the wage bill (wage times employment). The results suggest that all low-skilled workers (and unskilled workers in particular) experience fairly large gains in total remuneration as a result of minimum wages. This is not surprising considering the extent of the simulated wage increases (see Table 5.3). However, the income-eroding effect of job losses is clear: factor income gains deteriorate as the wage elasticity increases and job losses among low-skilled workers rise. At the benchmark wage elasticity level of $\eta = 0.7$, low-skilled workers experience a 3.0 per cent increase in total earnings (short-run scenario).

Interestingly, though, is the observation that even at a high wage elasticity level ($\eta = 2.0$) the low-skilled wage bill still increases despite what economic theory might predict. It is true that in a theoretical partial equilibrium context the wage bill is expected to decline at elasticity levels beyond unity, but in a general equilibrium context indirect effects also come into play. The fact that the medium-skilled wage bill declines at this wage elasticity value does, however, attest to the fact that income declines associated with employment losses will eventually outweigh the wage income gains.

Total factor income of skilled workers declines due to minimum wage legislation, irrespective of the wage elasticity level. This relates to the scale effects observed earlier, i.e. there is an overall decline in demand for skilled workers, which causes skilled wages to

decline. Given factor mobility and the existence of wage differentials between sectors, the movement of workers between sectors may also result in changes in total factor income of skilled workers. The combined effect for all unskilled, medium skilled and skilled workers is a small rise in total factor income at low to moderate wage elasticity levels; for example, at $\eta = 0.3$ total labour income increases by 0.8 per cent, while at $\eta = 0.7$ the gain is only 0.3 per cent.

Evidence of negative scale effects and a contracting economy is also reflected in declining returns to capital and land, with the impact on the latter especially severe given the fairly large rise in wages in the agricultural sector. Combined income from all factors of production declines in all the scenarios, suggesting that gains in total wage income at low to moderate wage elasticity levels are overshadowed by the decline in the return to capital. Note that capital stock accounts for about 47 per cent of value added in the economy, i.e. it is important in determining changes in overall factor returns. Land only contributes about 0.4 per cent to overall value added, which suggests that the large decline in the returns to land has almost no bearing on overall factor incomes.

The long run results are very similar to the short run results, although factor income gains for low-skilled workers are marginally lower. Capital stock mobility allows for a reallocation of capital stock away from minimum wage sectors given declining profitability in these sectors. This greater mobility allows the returns to capital to recover slightly in the longer run. Land remains locked down in the agricultural sector and cannot 'migrate' to more profitable sectors; hence declining demand for agricultural commodities leads to an even greater decline in the return to land in the long run.

Table 5.5: Changes in Factor Incomes Without and With Labour Productivity Gains

No labour productivity gains										
	Short run					Long run				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
<i>Labour/Wage income</i>										
Unskilled labour	8.7%	8.2%	7.6%	6.9%	4.8%	7.8%	7.3%	6.9%	6.3%	4.5%
Medium-skilled labour	2.4%	2.0%	1.5%	0.9%	-1.2%	2.2%	1.8%	1.3%	0.7%	-1.3%
All low-skilled labour	3.9%	3.5%	3.0%	2.3%	0.3%	3.5%	3.1%	2.7%	2.1%	0.1%
Skilled labour	-2.3%	-2.4%	-2.4%	-2.4%	-2.3%	-2.7%	-2.5%	-2.5%	-2.5%	-2.5%
All labour	0.8%	0.6%	0.3%	-0.0%	-1.0%	0.5%	0.3%	0.1%	-0.2%	-1.2%
Capital	-2.7%	-2.7%	-2.7%	-2.7%	-2.7%	-2.4%	-2.6%	-2.6%	-2.7%	-2.8%
Land	-16.7%	-15.7%	-14.8%	-13.7%	-11.1%	-38.0%	-29.7%	-24.4%	-19.6%	-12.3%
Total factor income	-0.9%	-1.0%	-1.1%	-1.3%	-1.8%	-1.0%	-1.2%	-1.3%	-1.4%	-2.0%

With labour productivity gains (*)										
	Short run					Long run				
	25% lab. prod. ↑ ($\eta = 0.7$)	50% lab. prod. ↑ ($\eta = 0.7$)	75% lab. prod. ↑ ($\eta = 0.7$)	100% lab. prod. ↑ ($\eta = 0.7$)	125% lab. prod. ↑ ($\eta = 0.7$)	25% lab. prod. ↑ ($\eta = 0.7$)	50% lab. prod. ↑ ($\eta = 0.7$)	75% lab. prod. ↑ ($\eta = 0.7$)	100% lab. prod. ↑ ($\eta = 0.7$)	125% lab. prod. ↑ ($\eta = 0.7$)
<i>Labour/Wage income</i>										
Unskilled labour	8.4%	9.0%	9.5%	10.0%	10.4%	7.7%	8.3%	8.8%	9.3%	9.7%
Medium-skilled labour	2.1%	2.5%	2.9%	3.2%	3.5%	1.9%	2.3%	2.7%	3.0%	3.3%
All low-skilled labour	3.6%	4.1%	4.5%	4.8%	5.1%	3.3%	3.7%	4.1%	4.5%	4.8%
Skilled labour	-1.4%	-0.7%	0.0%	0.6%	1.1%	-1.6%	-0.8%	-0.1%	0.5%	1.0%
All labour	1.1%	1.7%	2.2%	2.7%	3.1%	0.9%	1.5%	2.0%	2.5%	2.9%
Capital	-1.8%	-1.2%	-0.6%	-0.1%	0.4%	-1.8%	-1.2%	-0.6%	-0.1%	0.4%
Land	-13.5%	-12.4%	-11.6%	-10.9%	-10.3%	-22.6%	-21.3%	-20.2%	-19.4%	-18.6%
Total factor income	-0.3%	0.3%	0.9%	1.4%	1.8%	-0.5%	0.2%	0.7%	1.2%	1.7%

Note: (*) The 'with labour productivity gains' results show the change with respect to the base outcome, but can also be compared against the 'no labour productivity gains' results for $\eta = 0.7$ (see shaded cells in top half of the table) in order to understand the relative impact of labour productivity gains within a minimum wage scenario.

Source: CGE/micro-model results

An important result flowing from the above is that minimum wage policies tend to redistribute factor income from skilled workers and capital stock, both income sources that are typically attached to higher income households, to low-skilled workers, who are typically attached to lower income households. This is ultimately the aim of minimum wage policies, but it would be dangerous to use this evidence as a justification for minimum wages as a policy tool for redistribution before considering the overall effects. Redistribution of wage income comes at the expense of job losses among low-skilled workers, while rising production costs cause consumer prices to increase (as we see later). These additional effects make the overall distributional and welfare effects uncertain, thus requiring further investigation.

d) Efficiency Wage Effects

The bottom half of Table 5.5 shows the outcome of the minimum wage shock at a benchmark wage elasticity level of $\eta = 0.7$, only now assuming that workers experiencing an increase in wages also experience an increase in productivity that is proportional to the wage increase. For explanatory purposes it should be mentioned that the impact of increased labour productivity on employment and incomes is not always clear-cut, and depends on a multitude of direct and indirect effects. As workers become more efficient, fewer workers are required per unit of output. Thus, given demand conditions, an initial response from firms may be to lower employment levels of the more efficient factor. However, if only certain factors of production become more efficient relative to others, they now also now represent better 'value for money' from an employer's perspective, so, depending on the degree of substitutability between factors, a more likely scenario is an increase in demand for the more efficient factor. In a general equilibrium context, increased efficiency also means that production costs and consumer prices decline, which causes demand for firms' output to increase. Firms may therefore also respond by increasing employment of all factors of production, including those factors that did not experience labour productivity gains.

Employment changes under the 'with labour productivity gains' short run scenario are shown in Appendix Table 7. Clearly labour productivity gains are important in countering some of the employment losses associated with minimum wages. In the 25 per cent productivity gain scenario employment losses are already 11.7 per cent lower than in the benchmark scenario, while under the 125 per cent scenario job losses are 43.0 per cent lower. From Table 5.5 earlier it is also clear that increased productivity among low-skilled workers causes total factor income among these workers to rise more than before, with gains reaching 4.1 per cent when the productivity gain matches the wage increase (100 per cent scenario, short run). This is 30 per cent more than the gain when there is no increase in labour productivity. Increased productivity among low-skilled workers also has positive effects for skilled workers'

earnings. Already in the 75 per cent labour productivity scenario skilled workers no longer experience a loss in total factor income. Returns to capital and land also decline less sharply (or even increases in the case of capital in the high elasticity simulation) as low-skilled workers become progressively more productive.

This outcome is an important one, and shows that when labour productivity increases, the upward pressure on production costs caused by increased low-skilled wages is relieved somewhat, since fewer person hours are needed to produce the same level of output. This means that consumer prices do not increase as much as in the ‘no labour productivity’ scenario, and hence demand for output also does not decline to the same extent as before, i.e. the negative scale effects are smaller. However, while important, labour productivity gains are still unable to completely negate job losses associated with minimum wage policies, at least in the spectrum of labour productivity gains explored here.

e) Sectoral Production Effects

Appendix Table 8 shows the changes in activity output levels (production changes) in the short and long under both the without and with labour productivity gains scenarios. In demand-driven models such as this CGE model, sectoral production effects reflect changing consumption demand patterns, which in turn are caused by changes in relative prices and disposable income levels. The production results here are closely related to the employment changes discussed in detail above, and hence only the main results are highlighted.

A clear result emerging is that minimum wages generally have a dampening effect on economic activity, the more so the higher the wage elasticity of demand. The production losses in the long run are also marginally higher than in the short run. At the benchmark wage elasticity level ($\eta = 0.7$), activity output can be expected to decline by about 0.5 per cent. Gross Domestic Product (GDP), measured from the factor cost side, declines by 1.1 and 1.3 per cent in the short and long run benchmark scenarios (not shown in the table). These declines are, however, immediately reversed once labour productivity levels of minimum wage workers are adjusted upwards. In particular, the large declines in domestic services output – a result, as argued, driven to a large extent by the particular production structure found in this sector – become almost negligible when productivity increases match wage increases. Overall activity output could actually increase by 1.3 per cent in the 100 per cent scenario under both the short and long run closures. GDP rises by a similar magnitude in these scenarios (i.e. 1.4 and 1.2 per cent in the short and long run scenarios respectively).

2.3.2. Aggregate Household Income Changes

The change in real household disposable income of a household or household group can be used as measure of the welfare change experienced by that entity. There are 162

representative households in the CGE model. The analysis in this section is done at a more aggregated level – section 2.3.3 considers welfare and poverty results at the micro-level – and for that purpose the representative household groups are ranked by their average per capita income and grouped into three groups of equal size (i.e. 54 households in each group). The bottom third therefore represents the 54 poorest household groups, the second third the middle-income households and the top third are the richest households.⁷⁰

It is useful to understand how household disposable income is defined in the CGE model and to consider how the components of this welfare measure are affected in the minimum wage simulations. As per normal, household disposable income is calculated as gross household income net of personal income tax, remittances and savings. Gross household income is derived from two main sources. The first is combined factor income from the ownership of capital and land or from workers attached to households. The second main component is transfer income, which includes transfers from incorporated business enterprises (dividends and investment income), welfare transfers from government, and remittance income from other households or from abroad. Given the model closures selected for this study and the type of simulations performed, all transfer income components remain fixed in real terms and hence have no effect on gross income changes. Value added, however, is directly influenced by the minimum wage simulations. Value added also represents a very important income source for households, contributing about three-quarters of household income on average.⁷¹ Changes in value added are therefore important in determining changes in gross household income.

In order to move from changes in gross household income to changes in disposable household income it is necessary to also consider what happens to taxes and savings in the model. Taxes are calculated as a fixed share of household income, while the savings rate is flexible in terms of the savings-investment closure selected for these particular simulations. Although the savings rate increases in the simulations, the base-level savings rate is so low for most household groups that it does not have any significant impact on household disposable income levels. Given all of the above, the expectation is that changes in household disposable income (in percentage terms) will match changes in total factor income (shown previously in Table 5.5) very closely. This is confirmed by the results in Table 5.6. Of interest, therefore, is not the overall level of the change, but rather how different household

⁷⁰ The population of South Africa (approximately 42 million people in 2000) is distributed 45:35:20 between the three constructed household groups. Based on the SAM data, the average per capita income is estimated at R4 205, R11 419 and R52 382 per annum in the three groups respectively.

⁷¹ Value added is the combined payments to factors of production in the economy, where factors of production are owned by domestic institutions (government, enterprises and households) or foreign institutions. About 24 per cent of the return to capital is allocated to households. For land the figure is 93 per cent, while virtually all wage income is allocated to domestic households. On average, therefore, 64 per cent of value added in the economy is allocated to domestic households.

welfare groups are affected by minimum wages. This will depend mainly on factor endowments of household groups.

It is clear from Table 5.6 that relatively poorer households benefit more from minimum wages, which relates to the fact that these households are more likely to be linked to sub-minimum wage workers who benefit from the minimum wage policy. At the benchmark simulation (short run), households in the bottom group experience a 3.1 per cent increase in disposable income. The middle income group only experiences a marginal increase (0.3 per cent), while wealthier households experience a decline of about 2.5 per cent. This latter group relies more on skilled wages and returns to capital, hence this outcome. Since this wealthiest group earns about two-thirds of the household income in the economy, overall disposable income in the economy declines by 1.1 per cent.

Table 5.6: Changes in Aggregate Disposable Household Income

No labour productivity gains		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
	Short run					
	Bottom one-third	3.6%	3.3%	3.1%	2.7%	1.7%
	Middle one-third	0.8%	0.6%	0.3%	-0.0%	-1.1%
	Top one-third	-2.4%	-2.5%	-2.5%	-2.6%	-2.8%
	All households	-0.8%	-0.9%	-1.1%	-1.3%	-1.8%
	Long run					
	Bottom one-third	3.2%	2.9%	2.7%	2.4%	1.5%
	Middle one-third	0.7%	0.4%	0.2%	-0.2%	-1.3%
	Top one-third	-2.6%	-2.6%	-2.7%	-2.7%	-3.0%
	All households	-1.0%	-1.1%	-1.2%	-1.4%	-2.0%

With labour productivity gains		25% lab. prod. ↑ ($\eta = 0.7$)	50% lab. prod. ↑ ($\eta = 0.7$)	75% lab. prod. ↑ ($\eta = 0.7$)	100% lab. prod. ↑ ($\eta = 0.7$)	125% lab. prod. ↑ ($\eta = 0.7$)
	Short run					
	Bottom one-third	3.7%	4.2%	4.6%	5.0%	5.4%
	Middle one-third	1.0%	1.6%	2.0%	2.5%	2.8%
	Top one-third	-1.6%	-0.9%	-0.3%	0.2%	0.7%
	All households	-0.3%	0.4%	0.9%	1.4%	1.9%
	Long run					
	Bottom one-third	3.3%	3.9%	4.3%	4.7%	5.0%
	Middle one-third	0.8%	1.4%	1.9%	2.3%	2.7%
	Top one-third	-1.8%	-1.1%	-0.4%	0.1%	0.6%
	All households	-0.4%	0.2%	0.8%	1.3%	1.7%

Source: CGE/micro-model results

Turning next to the scenarios in which labour productivity is assumed to increase with increased wages, a much improved outlook for households is observed. Increased productivity among low-skilled workers limits employment losses, and households in the bottom two groups experience larger disposable income gains compared to the no labour productivity scenario (recall that $\eta = 0.7$ in all these simulations). Wealthier households are

also better off compared to the no labour productivity scenario. In fact, when labour productivity gains match the wage increase (100 per cent simulation) they no longer experience a decline in disposable income. Overall, when labour productivity increases by as little as 50 per cent of the increase in the average wage, disposable income in the economy starts to increase, which once again illustrates the important impact that labour productivity adjustments can have in a minimum wage scenario.

2.3.3. Poverty and Distributional Effects at the Micro-Level

The purpose of the micro-level models used here is to calculate changes in individual incomes that relate to the specific policy shocks run in the CGE model. Once income changes have been calculated it is possible to evaluate the poverty and distributional effects of the policy shock at the micro-level as opposed to the more aggregated level permitted in a CGE model. Appendix Table 6 shows the baseline poverty estimates against which the changes in P_0 , P_1 and P_2 are measured in the minimum wage simulations. These poverty rates are shown for poverty lines ranging from R1 000 to R4 000 per capita per annum (2000 prices). Poverty analyses conducted in the past in South Africa have usually adopted poverty lines in the region of R3000 to R4000 per annum as indicative of ‘normal’ poverty. A poverty line in the region of R2000 per capita per annum (this is roughly equivalent to a \$2-a-day poverty line) is sometimes used as a measure of extreme poverty (see for example Hoogeveen and Özler, 2006, Van der Berg et al., 2005 and earlier chapters). Only results from the short-run minimum wage scenarios (without and with labour productivity adjustments) are linked to the micro-level models.

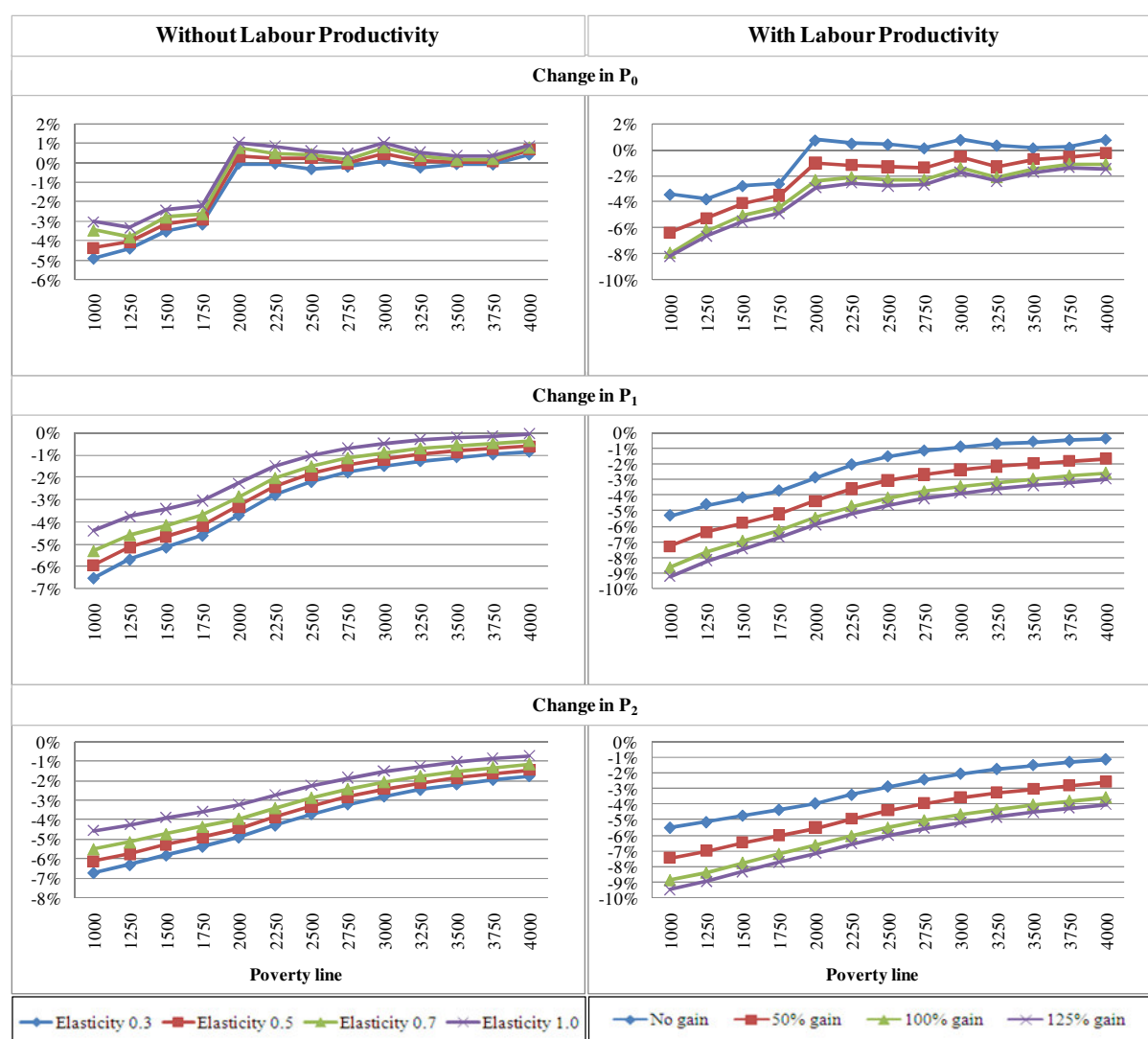
a) Micro-Incidence Model Results

We first consider results from the micro-incidence model. Figure 5.5 below shows the percentage changes in the three measures of poverty and for poverty lines ranging from R1 000 to R4 000. Results are shown for both the simulations with and without labour productivity gains.

Reductions in poverty appear to be greatest when the wage elasticity is low or when labour productivity gains are high. Clearly, the extent of the negative employment consequences of minimum wages is a key factor in determining the poverty impacts: whereas high wage elasticity levels are associated with a greater loss in employment, increased productivity levels counter employment losses. The poverty results for all three poverty measures further appear to be more favourable at lower poverty lines, suggesting that relatively poorer households gain more from minimum wage legislation. This is also not unexpected given that minimum wage policies target low-wage workers, with those furthest away from the minimum wage and more likely to be vicinity of the low poverty lines gaining the most.

Interestingly, once we move to the R2 000 poverty line the decline in poverty observed at lower poverty lines disappears or even increases for high elasticity values. The effect is less severe under the labour productivity scenarios. It is unclear exactly why a R2 000 poverty line appears to be such an important watershed, but it may relate to the fact that most of the minimum wages are in the region of R1 000 per month or R12 000 per annum (see Table 5.1). The household size of households in the vicinity of this poverty line is about six, which implies that the minimum wage equates to a ‘per capita wage’ of about R2 000 per annum. The implication is that once household size and within-household group income sharing is taken into account, minimum wages as applied in South Africa only appear to have noticeable effects at ‘extreme’ poverty lines below R2 000.

Figure 5.5: Changes in FGT Poverty Measures: Micro-Incidence Approach



Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

Both the line graphs for P_1 and P_2 are much smoother than the line graphs for P_0 , which is expected given that these measures take into account changes in the average income gap below a particular poverty line and not only the number of poor at a specific point in the

income spectrum. Once again the respective declines in P_1 and P_2 are higher at lower poverty lines and close to zero at higher poverty lines.

The distribution of job gains and losses in the micro-incidence model is an important issue. As explained in Chapter 4, job gains and losses will follow the factor endowment proportions in the base data of the CGE model. This allocation ignores personal characteristics of workers that might be affected by the policy. It is plausible to think that job losses will in reality only occur among sub-minimum wage workers and that those further away from the minimum wage are more likely to lose their jobs. Such a selection process is not permitted in the micro-incidence model.

A related limitation is that income gains or losses in each CGE representative household group are shared equally among the members. The implication is that wage income gains and losses ultimately observed at the household group level in the CGE model have been ‘averaged out’. These same changes are eventually passed down to the micro-incidence model, and hence the poverty effects in the micro-incidence model are muted.

b) How can a Partial Equilibrium Micro-Model Contribute to the Debate?

The fact that group wages rather than individual wages are adjusted in the CGE minimum wage simulations is a tenuous modelling issue. A micro-level partial equilibrium model such as the one used by Hertz (2002) to explore the employment and poverty effects of minimum wages for domestic workers presents an alternative to a CGE modelling approach. Such a model, which is calibrated with micro-level data, allows for the direct adjustment of individuals’ wages. As a further advantage the modelling framework permits the identification of individuals that are most likely to lose their jobs as a result of minimum wages. If data is available, it may also be possible to feed wage income changes associated with minimum wages and employment losses into a household income generation function, which enables the analysis of income and poverty effects at the household level.

As discussed at length in Chapter 4, however, employment losses associated with minimum wages may relate both to direct substitution effects and indirect price and demand effects. Hence, partial equilibrium models potentially underestimate the overall employment effects associated with minimum wages, especially at low elasticity levels.

To illustrate this, a partial equilibrium model similar to that used by Hertz (2002) was set up. In this model, sector-specific employment changes are calculated by simply multiplying the average wage change for low-skilled workers (see Table 5.3) employed in each sector by the sector-specific partial or own-price wage elasticity (see Appendix Table 5). This yields low-skilled employment losses by sector. The economy-wide job losses in this model are Table 5.7 below. A comparison with the employment results obtained earlier in the CGE model

reveals the underestimation of employment losses at low elasticity values in the partial equilibrium model.

Table 5.7: Comparison of Job Losses in Partial and General Equilibrium Models

	Simulation elasticity value			
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$
Partial equilibrium model job losses	163,757	272,928	382,100	545,856
CGE model job losses (short-run scenario, no labour productivity gains)	363,049	407,139	448,991	507,457
Exchange rate depreciation (short-run scenario, no labour productivity gains)	0.83%	0.87%	0.90%	0.93%

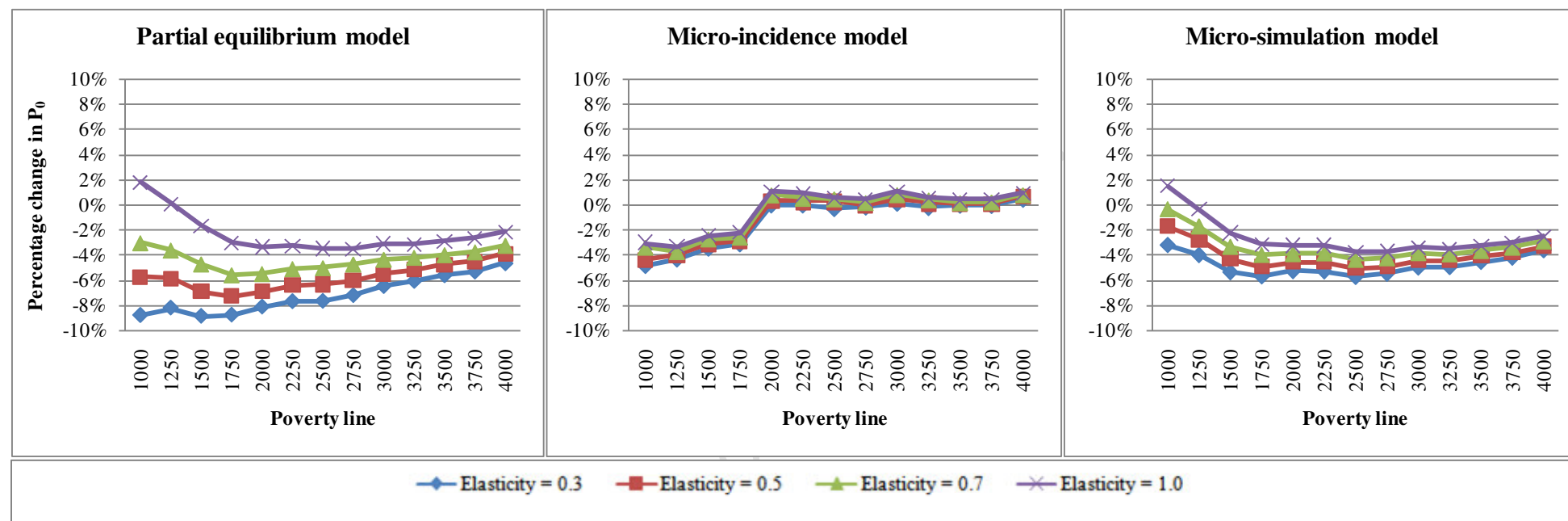
Source: CGE/micro-model results

Part of the reason why a partial equilibrium model underestimates the employment loss is because it is essentially a fixed-price model. Since the CPI is the numéraire in the model, all prices are pegged to the inflation basket. It is therefore not possible to show directly what the impact of minimum wages is on prices in the economy other than to show how this effect is revealed in greater job losses (as in the table above) or demand-side shocks (see Table 5.6). However, since minimum wages reduce the competitiveness of domestic producers relative to foreign ones, the inflationary effect of minimum wages is revealed in the exchange rate depreciation. Model results show that the currency depreciates by between 0.83 and 0.93 per cent as a result of minimum wages (Table 5.7).

The partial equilibrium modelling framework is also used to analyse the net poverty effects associated with income gains and job losses. Job losses reported in Table 5.7 were allocated among individuals using the same approach as in the ‘basic’ scenario of the micro-simulation model (see Chapter 4 for details and discussions below). The poverty results obtained are shown in Figure 5.6 (P_0) and Figure 5.7 (P_1) below. These figures also include the poverty results obtained earlier under the micro-incidence model (centre panel).

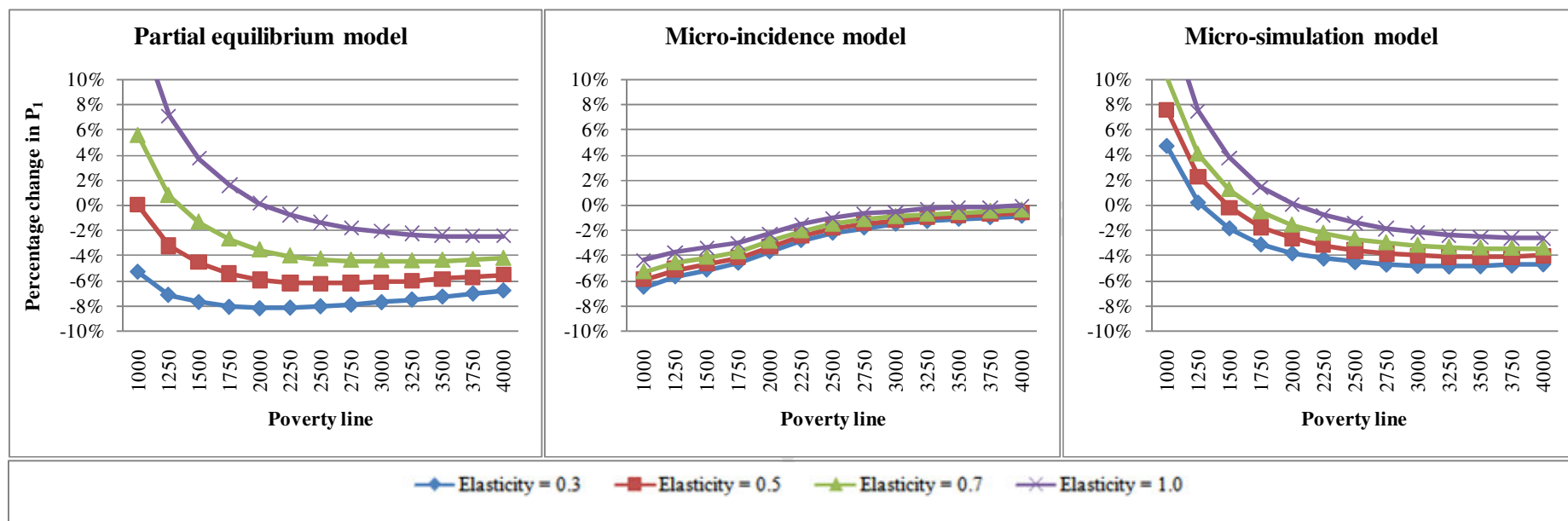
In contrast to the results obtained in the micro-incidence model, the partial equilibrium model shows fairly large decreases in poverty at low poverty lines and also at high wage elasticity levels. This relates to the fact that, when working with individual households at a micro-level, a large number of households lose all their income when workers in those households lose their jobs. As income falls to zero (or close to zero), the poverty impact at low poverty lines is high. In the CGE model such income losses are shared at the household group level, thus in effect cushioning the poverty decline.

Figure 5.6: Changes in P_0 : Comparing Results under Different Modelling Approaches



Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

Figure 5.7: Changes in P_1 : Comparing Results under Different Modelling Approaches



Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

It is clear from this comparison that the CGE-micro-incidence model produces much more moderate poverty changes. There is also much less variance across scenarios with different wage elasticity levels. While this is partly due to averaging out of changes at the factor and household group level (as discussed), it also relates to the capturing of indirect effects in the CGE model. Whereas the partial equilibrium model ignores price increases, especially at low wage elasticity levels, the CGE model explicitly captures these effects. This means that the poverty-reducing potential of minimum wages is probably overstated in the partial equilibrium model at low wage elasticity levels.

Ultimately, however, neither the partial equilibrium or micro-incidence model is truly satisfactory; both have distinct advantages and disadvantages. One option is to design the partial equilibrium model differently so that production cost and price effects are explicitly modelled. For example, the model can be set up to calculate the extent to which firms would have to increase prices in order to recover production cost increases associated with minimum wages. This, however, effectively becomes a zero-wage elasticity scenario where no substitution takes place that might only be suitable for a very short-run scenario.

c) Comparing Results from a Micro-Simulation Model

CGE models allow for a more balanced analysis of the minimum wage effects than a partial equilibrium analysis by considering both labour market substitution and indirect demand and price effects in a single model framework. Although CGE analyses can be complemented by a simple top-down micro-incidence analysis of the micro-level effects, this is not entirely satisfactory for reasons explained.

An alternative to the CGE-micro-incidence approach is a CGE-micro-simulation modelling approach. The poverty results from the micro-simulation model are shown in the right-hand panels of Figure 5.6 and Figure 5.7 above. There is clearly much more variation in the poverty results at different wage elasticity levels in the micro-simulation approach compared to the micro-incidence approach. At high wage elasticity levels the results look remarkably similar to those obtained under the partial equilibrium model. At low wage elasticity levels, however, poverty reduction is nowhere near as large as they were in the case in the partial equilibrium model. This relates to the fact that this model accounts for the adverse effects of higher price increases in the low elasticity case.

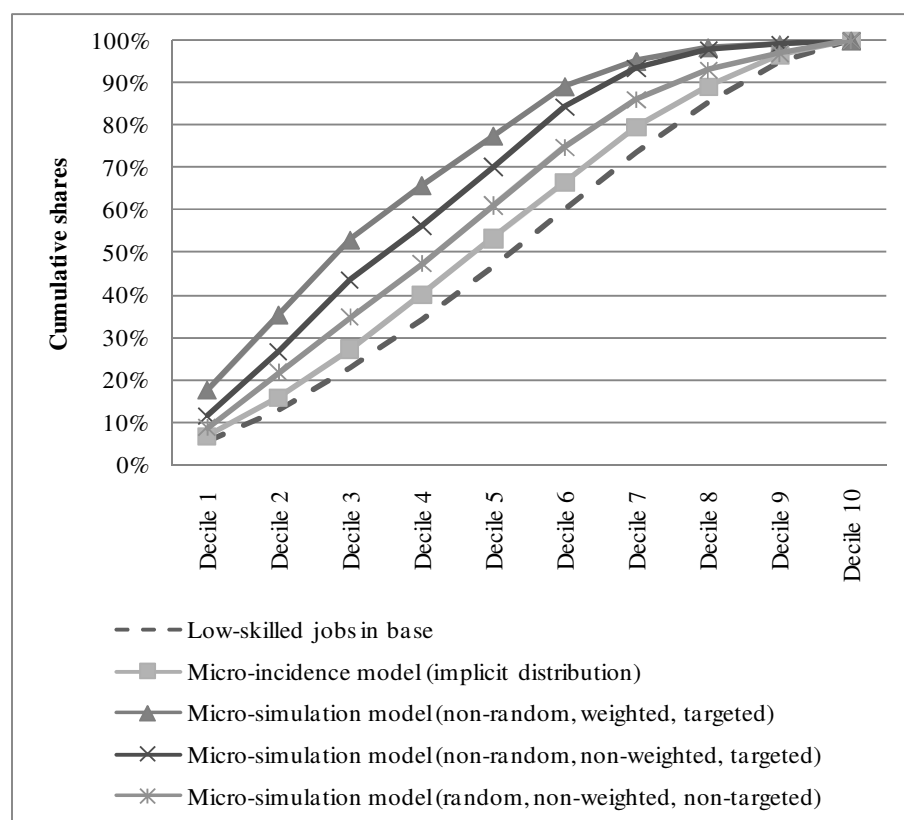
Compared to the micro-incidence results, however, the micro-simulation poverty results look very different. Although under both models the indirect demand and price effects are the same (i.e., as estimated by the CGE model), these models differ fundamentally in terms of their assumptions about job loss distributions. A particular striking difference between the two modelling approaches is the smaller decline in poverty in the micro-simulation model at

the lower poverty lines. This relates to the assumption in this model that job losses disproportionately affect workers that are further away from their respective minimum wage levels and hence also relatively poorer than other sub-minimum wage workers. These effects are not properly accounted for in the micro-incidence model due to the ‘averaging out’ of factor income gains and losses in the CGE model. For similar reasons, the models also predict very different results for P_1 , which rises sharply at low poverty lines. The suggestion is that minimum wages that lead to disproportionate job losses among the poorest of the minimum wage workers (i.e., those that are further away from the minimum wage) will cause inequality among the very poor to rise substantially.

Of course, the assumption about how job losses are distributed among minimum wage workers has a major bearing on the outcome. There are many other ways in which the job loss allocation process can be modelled, and under each specification the distributional and poverty results might look different. The results presented above represent the outcome under a ‘basic’ setup (which we have called the ‘non-random, weighted, targeted’ scenario). For illustrative purposes, we produce results under several alternative assumptions about the job loss allocation, i.e., a ‘non-random, non-weighted, targeted’ scenario and a ‘random, non-weighted, non-targeted’ scenario.⁷²

Figure 5.8 shows the cumulative job losses by household income deciles under these alternative specifications of the micro-simulation model. For comparative purposes we also show the implicit distribution of job losses under the CGE or micro-incidence approach (see dashed line). Clearly, the micro-simulation model generates results that are much more biased against poorer households than the standard micro-incidence approach. In fact, if we assume the bottom four deciles to represent the poor, the micro-incidence model shows that 40 per cent of job losses will impact on this group, compared to 66 per cent in the micro-simulation model.

⁷² See Chapter 4 for a detailed explanation. To recap, ‘non-random’ in this context refers to the use of estimated unemployment probabilities in the allocation of job losses, while ‘weighted’ implies the use of a weighting factor that is applied to increase the unemployment probability of workers further away from the minimum wage. ‘Target’ refers to the assumption in the micro-simulation model that only sub-minimum wage workers are affected by job losses.

Figure 5.8: Cumulative Job Losses under Alternative Micro-Modelling Approaches ($\eta = 0.7$)

Source: CGE model results

The outcome, however, is quite different under alternative assumptions of how job losses are allocated. Under the ‘non-random, non-weighted, targeted’ scenario the weights are removed and only the estimated unemployment probabilities determine who among the sub-minimum wage workers will lose their jobs. Job losses are now slightly less biased against the poor. An even more favourable outcome for the poor is achieved in the ‘random, non-weighted, non-targeted’ scenario where job losses are assumed to affect any low-skilled worker randomly, i.e. personal characteristics are not taken into account while any low-skilled worker and not only the sub-minimum wage workers are vulnerable to job losses. This latter outcome, as expected, closely resembles that under the micro-incidence model.

Some would argue that a minimum wage scenario with random job losses (i.e., the micro-incidence model) is appropriate when the affected workers consist of a fairly homogenous group, e.g., domestic workers. In CGE simulation where the impact largely bypasses the labour market, e.g., a welfare transfer subsidy (Pauw and McDonald, 2006) or trade policy experiments (Thurlow, 2007), a micro-incidence approach to poverty analysis is also justifiable. However, the CGE-micro-incidence is limited when large changes in the labour market are observed or where there is much heterogeneity among workers within factor groups. Also, when CGE scenarios predict (large) net job gains, the micro-incidence approach will almost certainly be problematic since the distribution of the unemployed – the

primary beneficiaries of new jobs – is very different from the distribution of the currently employed. This point was argued previously in Chapter 4 (see Figure 4.6).

d) Some Caveats and Areas for Future Research

There are, of course, some caveats. The first concerns the issue of consistency between CGE results and the micro-model results. Micro-incidence results are fully consistent with the CGE model due to the fact that percentages changes in household group incomes in the CGE model are applied to individual households in the survey data. Therefore, in both the CGE model and the micro-incidence model, aggregate household income declines by about 1.1 per cent (see Table 5.6 earlier). However, in the micro-simulation model the decline in aggregate household income is only 0.1 per cent. This suggests that the poverty-reducing potential of minimum wages is possibly overstated in the micro-simulation model relative to the micro-incidence model.

This inconsistency stems from the fact that the minimum wage changes applied in the CGE model simulations are aggregated at a factor group level, whereas in the household income generation function in the micro-simulation model these same wage changes are applied to the relevant individuals and then aggregated at the individual household level. While some ingenious methods have been proposed to correct for these inconsistencies through adjustment of sampling weights (see Robilliard et al., 2001), the minimum wage simulations are different from the norm in that individual wages of minimum wage workers are adjusted directly rather than using the average factor group wage changes from the CGE model. As a result no attempt was made to force consistency between the two models.

A second caveat relates to the issue of model feedback. As discussed in Chapter 4, a micro-simulation model, per definition, generates a household income vector that looks very different to the household income vector generated by the CGE model given the distinct nature of the underlying income generation functions in the two models. This means that without some form of feedback from the micro-simulation model to the CGE model, the indirect demand effects in the CGE model are arguably incorrectly specified.

The problem is probably small enough to ignore. However, to illustrate just how different household incomes are distributed depending whether a CGE-micro-incidence or CGE-micro-simulation model is used, inequality results are shown in Table 5.8. The micro-incidence model predicts virtually no change in overall inequality, measured in this instance by the Gini coefficient and the Theil-L index. This is despite the high level of disaggregation in the household accounts of the CGE model. The micro-simulation model, in contrast, yields much greater changes in inequality.

Table 5.8: Inequality Results: Micro-incidence and Micro-simulation Models

Wage Elasticity	Change in Gini		Change in Theil-L	
	Micro-incidence	Micro-simulation	Micro-incidence	Micro-simulation
$\eta = 0.3$	-0.3%	-1.3%	-0.6%	-3.4%
$\eta = 0.5$	-0.3%	-1.2%	-0.6%	-3.2%
$\eta = 0.7$	-0.3%	-1.1%	-0.5%	-2.9%
$\eta = 1.0$	-0.3%	-1.0%	-0.5%	-2.7%

Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

3. Final Remarks

This chapter has produced a rich set of results for various minimum wage scenarios that have not previously been explored in such depth in this country. A common message across the different modelling approaches is that poverty outcomes improve as the wage elasticity parameter becomes smaller. In general, a minimum wage policy seems effective at reducing the poverty headcount rate at least when the employment response is small.

However, the CGE-micro-incidence and CGE-micro-simulation models suggest very different outcomes at different poverty lines. The micro-incidence results show that those at extremely low poverty lines – between R1 000 and R2 000 per annum – will benefit from larger reductions in both the poverty rate and depth of poverty compared to those at higher poverty lines. In contrast, the micro-simulation model, which better captures the impact of job losses on individual welfare at the low-end of the distribution, suggests an increase in the depth of poverty at very low poverty lines. This model, however, predicts larger declines in P_0 and P_1 at higher poverty lines compared to the micro-incidence model.

In choosing between the two approaches, it was argued that the micro-simulation approach is superior. Despite some drawbacks – the most important being the issues of consistency and feedbacks between the micro- and macro-levels of the combined model framework – they do offer a huge advantage to modellers in terms of the flexibility in modelling labour market impacts. The income generation function in the micro-simulation model also ensures that income gains and losses associated with factor market effects are better reflected at the individual household level. Of course, with greater flexibility also comes a responsibility to be honest and upfront about the behavioural assumptions of the model. The next chapter applies a similar modelling framework to a wage subsidy scenario.

Chapter 6. Fighting Poverty Through Job Creation: Can Wage Subsidies Work?

Unlike the case of minimum wages, South Africa does not currently have a ‘pure’ wage subsidy policy. However, in recent years wage subsidies have been proposed on many occasions as a suitable policy option for addressing unemployment and poverty in this country. A direct outcome of some of these earlier proposals has been the adoption of learnerships, which closely resemble training-linked employment subsidies used elsewhere. The analysis here aims to explore the efficacy of a pure wage subsidy programme in addressing unemployment and poverty in this country.

Section 1 starts with a brief discussion of the appropriateness of a wage subsidy programme in South Africa, drawing on earlier analyses in Chapter 2 and Chapter 3. This section also provides an overview of the wage subsidy proposals that have been put forward in this country. Finally, some preliminary policy lessons on programme design are drawn. Section 2 then presents the results obtained from various sets of policy simulations performed, once again, with the aid of a CGE model linked to two types of micro-models. Model limitations prevent us from exploring all the policy questions that one might have around wage subsidy design and implementation. The model is, however, suited to exploring (a) the effectiveness of the policy in terms of generating jobs at different wage elasticity levels, and (b) assessing costs and financing options, the latter being an important value addition as far as the South African literature is concerned. The micro-level analyses, in turn, permit a closer evaluation of the poverty and distributional effects of wage subsidy schemes. Final remarks are made in section 3, with Chapter 7 drawing together the main conclusions of the study.

1. Wage Subsidies in the South African Context

1.1. Why Wage Subsidies Make Sense

There are several justifications for wage subsidies. In developing countries facing labour shortages, wage subsidies may be offered to workers as an incentive to enter into full-time employment. In the South African context the idea of a wage subsidy is borne more out of the need to stimulate labour demand in order so that more unemployed jobseekers can be absorbed into employment. Below we consider some reasons why wage subsidies may be seen as the policy option of choice to reduce unemployment in the short run, drawing in part on some of the findings from Chapter 2.

The first justification pertains to poverty and socio-economic effects of wage subsidies. Any reduction in unemployment, *ceteris paribus*, will have a positive effect on poverty levels. Furthermore, the existence of unemployment constitutes a loss in output, while the dynamic aspects of high unemployment cannot be ignored: *“workers who are unemployed today are not acquiring the skills and experience that will contribute to their productivity in the future”* (Levinsohn, 2008:2). From a social perspective unemployment is associated with a loss of morale and an increase in idleness and crime, especially when it is high among the youth as is the case in South Africa. If wage subsidies raise employment levels, many of these negative externalities associated with unemployment are mitigated.

A second reason why wage subsidies are justifiable is that they increase the attractiveness of certain workers from a hiring perspective. Unemployment in South Africa is generally described as a structural problem, which may lead some to argue that wage adjustments (either directly or through wage subsidies) do not present a viable solution. This may be true for the unemployable, but there seems to be some degree of consensus that relatively high wages of low-skilled workers – or more precisely the relatively high unit labour costs of these workers – are also partly to blame for the unemployment problem. In this regard Go et al. (2009) argue that macroeconomic management of aggregate demand swings may be less effective than wage subsidies for the simple reason that wage subsidies affect labour demand directly by addressing the issue of ‘attractiveness’ of certain workers. Wage subsidies certainly do not address the structural unemployment issues (e.g. low skill levels and poor educational attainment).

The third justification for wage subsidies (and one that is related to the previous point) is that they reduce the risk associated with hiring, training and firing. The reluctance of firms to hire young labour market entrants is a common firm behavioural characteristic that is described in so-called ‘overlapping generations’ models. In the South African labour market this problem is particularly severe. This is caused chiefly by two factors. Firstly, the South African hiring

and firing processes are thought to be rigid and highly regulated, which adds to the hiring and firing costs (even if not direct or material, then implicit; see Chapter 2). Secondly, firms tend to be reluctant to hire young labour market entrants as they often require extensive training due to poor schooling outcomes and limited job experience. Once trained they become susceptible to ‘job hopping’ or being hired away by competitors. As a result South African firms have adjusted their risk profiles over the years to reflect high non-wage costs, explaining why employment demand is so sluggish. Firms rather avoid employing people whom they think might not succeed in the workplace since any training costs incurred are a deadweight loss, while dismissals are costly. A wage subsidy, Levinsohn (2008) argues, reduces all of these risks to the firm and makes it easier to justify hiring young people, even if they are considered to be more risky.

Wage subsidies will only be effective at creating many job opportunities when the wage elasticity of labour demand for subsidised workers is high. The South African estimates suggest that the economy-wide average wage elasticity is around 0.7 (see for example Fallon and Lucas, 1998, Fedderke and Mariotti, 2002, Fields et al., 2000). Thus, although the wage elasticity is inelastic (or less than unity), a fairly significant employment effect might still be expected. Unfortunately many other factors affect the success of a wage subsidy policy in generating employment, and very often these factors relate to the administrative costs incurred by employers versus the benefits of actually receiving a subsidy (see section 1.3 below). It is therefore uncertain to what extent the true employment effect will reflect the underlying wage elasticity in the economy, which is why the design of a wage subsidy scheme is so important.

1.2. South African Wage Subsidy Analyses and Proposals

Several South African studies have looked into wage subsidies as a way to promote employment among low-skilled or young workers in particular. Heintz and Bowles (1996) produced one of the first policy papers that focused mainly on the theoretical aspects around wage subsidy policy design, but also included some basic calculations of what the employment effects might look like and how the policy could be financed (they proposed a factor use tax on capital stock). They conclude that although wage subsidies could be considered a “*bold approach*” to addressing unemployment, it is perhaps time to “*seriously consider wage subsidies as a policy alternative*” (Heintz and Bowles, 1996:205). In a comprehensive country study under auspices of the World Bank, Lewis (2001) also explored the idea of a wage subsidy. This study also held a very positive view of wage subsidies and proposed that such a programme, targeted at unemployed individuals with limited or no labour market experience, should form an integral part of a strategy for skills accumulation and labour reform in South Africa.

At around the same time the Department of Labour started showing interest in the idea of subsidised employment creation. The youth was identified as a particularly vulnerable group that may require special intervention in order to improve their employment prospects. In its employment strategy framework *Creating Jobs, Fighting Poverty* they implore researchers to explore the option of subsidised youth employment combined with skills development programmes (Department of Labour, 1998). National Treasury articulated more directly for the need to investigate policies that would “*encourage job creation by reducing the cost of hiring new workers*” (National Treasury, 2001:76-77). Wage incentive schemes and learnerships were mentioned as specific policies that might be considered.

After the initial wave of interest between 1996 and 2001, the idea of a pure wage subsidy scheme has recently once again surfaced in policy circles. Pollin et al. (2006), for example, propose that such a policy forms one of the three key components of an employment promotion and poverty reduction strategy (the other components being spending on public infrastructure investments and social transfers). Describing their particular wage subsidy programme as a “*hybrid policy intervention*”, Pollin et al. (2006:96) propose a simultaneous wage and credit subsidy.⁷³ While wage subsidies will directly promote employment growth, they argue that credit concessions to private firms would further enable firms to increase their scale of production and hence raise their hiring capacity. Hiring will also be promoted indirectly through backward multipliers. The idea of such a hybrid approach, they explain, derives directly from Lewis’s (2001) earlier suggestion that wage subsidies and demand-side job creation policies should not be seen as mutually exclusive.

A more recent proposal came from the International Panel on Growth in South Africa, popularly known as the ‘Harvard Group’. In one of the background papers to their report, Levinsohn (2008) proposes a youth wage subsidy as one of two labour market policy interventions (the second being immigration reform that would allow easier access to the local job market for foreign high-skilled workers). Levinsohn’s (2008) youth wage subsidy is targeted at all young people once they turn 18, and remains available even if labour market entry is deferred (for example to study further). Levinsohn (2008) provides some fairly specific ideas around how the subsidy could be implemented and managed. The main idea is that an ‘account’ of some sorts is opened for each young person upon graduating from high school from which employers can then draw a subsidy until the subsidy amount is depleted, thus making his proposed scheme similar to the idea of a worker-initiated subsidy (see Chapter 3).

⁷³ This idea goes against Heintz and Bowles’ (1996) earlier recommendation for a capital tax to finance the subsidy. Incidentally James Heintz himself was also one of the co-authors in the Pollin et al. (2006) study.

Recently, government has once again shown an interest in wage subsidies as a future policy programme. During his State of the Nation address in 2008 former President Thabo Mbeki spoke of “*employment subsidies for direct job-creation for targeted groups*” as one of the key interventions that would form part of government’s “*integrated and comprehensive anti-poverty strategy*” (Mbeki, 2008). The policy is still in a development phase and funds have not yet been formally set aside for such a programme. The *Budget Speech 2008* merely made reference to the fact that “*options ... [were] being examined*” (Manuel, 2008), presumably referring to National Treasury’s recently commissioned research into wage subsidies (by Go et al., 2009).

The idea of using wage subsidies as part of a comprehensive reform of South Africa’s pension scheme already surfaced in the *Budget Review 2007* (National Treasury, 2007). The current social old age pension (SOAP), the report argued, effectively acts as a disincentive for people to save, since any retirement funding saved privately would eventually displace potential earnings from SOAP. Thus, as part of the proposed pension reform, all employed persons would be required to contribute to a government-administered pension scheme during their working lives, which would ensure that at least part of the burden on SOAP would be reduced (also see Paton, 2009). However, in order to offset the loss in disposable income that will arise when pension contributions have to be made (or the decline in employment if employers make contributions on behalf of workers) a wage subsidy for low-wage workers is also proposed. They estimate that the cost of such a subsidy could range between R20 and R30 billion per annum. Of course, if the wage subsidy simply offsets the cost of the mandatory pension contributions of low-wage workers it effectively becomes a ‘pension subsidy’ made by government on behalf of workers rather than a wage subsidy, i.e. the wage-employment relationship is unchanged.

Given their role as custodians of the SOAP, the Department of Social Development’s interest in the pension reform proposals is obvious. This Department, through its grant management agency, South African Social Security Agency (SASSA), may yet play a direct role if requested to administer pension payouts upon retirement as is proposed in the *Budget Review 2007*. However, the Department of Social Development has also expressed interest in the use of active labour market policies as a way of reducing the financial burden on the South African welfare budget. In a discussion document it is claimed that 36 per cent of disability grant recipients “*have physical disabilities that should not necessarily render them unable to obtain gainful employment*” (see Department of Social Development, 2004:3). The report further argues that job placement and adult education programmes have not specifically targeted recipients of child support grants, but that a range of “*active labour market measures, skills development programmes, special employment and labour intensive development programmes and labour intensive government services*” could be used to draw

these people into employment and off the welfare system (Department of Social Development, 2004:7).⁷⁴

In addition to the research by Go et al. (2009), a team from the Southern African Labour and Development Research Unit (SALDRU) is currently conducting wage subsidy research on behalf of the Department of Social Development.⁷⁵ The African Micro-Economic Research Umbrella (AMERU) has also recently secured the go-ahead for a wage subsidy pilot programme. The programme entails a randomised experiment whereby 4 000 young people will be interviewed. A worker-side wage subsidy is then randomly allocated to half of the unemployed. A follow-up interview one year later will provide information as to whether the subsidy has made a difference. Where possible, employers of targeted and non-targeted programme participants will be interviewed to get a perspective on the demand-side (Rankin, 2009). This study itself extends on earlier research by (Pauw and Edwards, 2006).

1.3. Policy Design: Options, Guidelines and Lessons

Several policy design and implementation lessons can be drawn from the preceding discussions here and in Chapter 2 and Chapter 3. Before continuing with the economy-wide analysis it is necessary to take stock at this point. A more detailed set of policy recommendations are included in Chapter 7.

The most important goal of a wage subsidy policy is job creation, but the international evidence suggests that expectations in this regard are seldom met. Proponents of a South African wage subsidy scheme should take heed to these very serious alarm bells. For a wage subsidy policy to be successful in generating above-equilibrium employment it has to be designed correctly and implemented effectively.

Given the particular features of the South African labour market problems – mass unemployment and excess supply of low-skilled workers – a firm-side subsidy is justified. Evidence suggests that the labour supply curve is highly elastic (and in the extreme case the supply curve is horizontal), which means a worker-side subsidy will mainly have the effect of raising the wages of those who are currently employed. Some have in fact argued in favour of worker-side subsidies in South Africa given the belief that firms here also have fairly inelastic or even asymmetric labour demand curves (see for example Loewald and Fletcher, 2001). The implication of an asymmetric labour demand curve is that while an increase in the wage may lead to a decline in employment, a decline in the wage may not lead to an increase

⁷⁴ Wage subsidies may also simply reduce the burden on, say, pensioners. Once more people enter employment, pensioner households will become smaller and fewer people will rely indirectly on the pension income. This may relieve pressure on the state to increase welfare payments.

⁷⁵ This author is involved in the project.

in employment of the same magnitude. This also relates to the existence of market power – if firms capture subsidies as rent rather than raising employment and lowering output prices, the employment effects may be small.

The administration of a wage subsidy programme is a central issue. The South African experience with learnerships is a clear example of where a policy is failing in meeting certain objectives (in this instance raising employment levels among young labour market entrants) because of the administrative problems and the bureaucratic complexities involved in participating in the programme. A more detailed discussion of learnerships is included in the Appendix (see section 4.2.1), but the suggestion from this is that a wage subsidy programme should be kept as simple as possible so as not to act as a disincentive to firms (and especially smaller firms) to participate.

Administratively speaking, the simplest (albeit costly) approach is to design the subsidy as a general subsidy. This implies that wages of all existing and new workers are subsidised. Under this approach firms receive a windfall gain even if they do not raise employment. One way of circumventing the problem of low employment generation is to design the policy as a marginal subsidy where only employment above some long term employment growth trend is subsidised. The downside of such a marginal subsidy programme is the high monitoring and evaluation costs associated with it, while the administrative requirements of such a policy may be very onerous on the employer. Marginal subsidy programmes may also be more conducive to labour turnover as firms replace existing workers with subsidised ones.

A slight variation on the standard firm-side subsidy model is the worker-initiated wage subsidy model such as the one proposed by Levinsohn (2008) for South Africa. Such a programme is effectively a marginal subsidy programme without the increased administrative burden. In fact, since it is worker-initiated, firms need to do very little to participate, even though it ultimately is a firm-side subsidy. The added advantage is that such programmes improve the supply-side job search incentives. This may therefore be the preferred approach, even though in the CGE model a firm-side general subsidy is modelled due to modelling limitations (see section 2.2).

International and local evidence suggests that beneficiaries of wage subsidy or related programmes are often those that would have found employment even in the absence of support. Those that are truly in need of assistance simply do not make it to the front of the job queue. This can be avoided through careful targeting of the policy. There are at least three reasons for targeting. Firstly, it may be necessary to reduce costs. Secondly, as discussed just above, it may be necessary to allow the truly vulnerable to benefit from the policy. The third relates to the fact that wage subsidies should not be seen as a blanket solution to unemployment in South Africa. Unemployment is a highly complex phenomenon in this

country, with elements of a structural problem, deficient demand and labour supply-side problems. It is therefore important to identify those subsets of unemployed persons that would in fact be absorbed into employment once the subsidy lowers the market wage.

There seems to be consensus around the idea of a youth subsidy that ties in with a broader suite of labour market policies aimed at improving skills and labour market absorption among the youth. This choice of target group for the South African case illustrates how policy targeting also has an important welfare objective. Earlier analyses have shown that the youth are particularly disadvantaged as far as employment prospects are concerned, despite the fact that they are becoming better educated. A firm-side subsidy in South Africa implicitly targets urban firms, since most firms are located in urban areas. Rural unemployment, however, accounts for a substantial share of unemployment in South Africa. In order to prevent increased rural-urban migration, complementary but very different kinds of active labour market policies may be required in rural areas (see earlier discussions in Chapter 2).

Heintz and Bowles (1996) argue that the small employment effects of wage subsidy programmes may relate to the fact that most of these policies are designed to be short-term policies. The full employment effect of a wage change may take several years to be realised, which means firms may choose not to participate if they feel the wage subsidy might end soon. A longer subsidy period may therefore be warranted purely from a participation perspective. The idea of wage subsidy programmes is that the experience gained during the period of subsidised employment will improve participants' employment prospects. If the subsidisation period is too short the participants may not yet have received enough training or experience to become attractive from an employer's perspective. In this regard training-linked wage subsidies may also be more effective at improving participants' employment prospects, provided the training period is sufficient to ensure adequate transfer of skills (see below).

It is further important that firm-side subsidies are generous enough to ensure participation by firms. Firms need to be incentivised to employ workers that may be perceived as being risky, while administrative costs incurred also need to be covered by the subsidy. It is unclear exactly what level of subsidisation would be deemed enough, and unfortunately economic models cannot predict this 'dividing line' between participation and non-participation. Consultation with stakeholders or a trial-and-error approach to policy design may therefore be necessary.

The issue of wage subsidy programmes linked to training comes up frequently in discussions, and warrants further careful thought here. Training-linked wage subsidy programmes arguably have merit when unemployment is linked to a skills deficit as is the case in South Africa. Experiences with training-linked wage subsidies elsewhere seem positive, but more

analysis is needed. In the South African case, though, the learnership programme has not had a significant impact on employment levels. It is therefore important to consider whether a wage subsidy programme in this country should also be linked to training. Some further remarks in this regard are made in Chapter 7.

2. Economy-Wide Analysis

2.1. Introductory Remarks about the Modelling

Once again, the South African CGE model forms the basis of the ex ante evaluations of a wage subsidy programme, while complementary analyses are done using micro-incidence and micro-simulation models. Given their design and setup, CGE models are somewhat restricted as far as simulation options are concerned. In the context of wage subsidies there are certain design issues that simply cannot be explored in this type of modelling framework. The first restriction relates to targeting options. CGE models make use of representative factor and industry accounts, which means that targeting options are restricted to the inclusion or exclusion of entire factor groups as they appear in the underlying SAM. For example, since age is not used in the classification of occupation groups, a youth subsidy cannot be modelled explicitly.

A second limitation associated with this modelling framework is that only general subsidies can be modelled; a marginal subsidy programme where a wage subsidy is only offered to any additional workers employed by firms cannot be modelled. This modelling limitation also relates to the use of representative factor groups in the model. The model assumes that all members of such a group are homogenous and earn the same equilibrium wage. It is therefore not possible to divide the workers within a factor group into new labour market entrants that are subsidised and existing workers that are not, simply because the model treats each factor group as single entity rather than as a group of individuals.

Fortunately, the addition of the micro-simulation model allows us to explore more varied targeting options. The approach adopted here is to assume a fairly broadly targeted wage subsidy programme as far as the CGE model simulations are concerned. Thus, as explained in more detail in section 2.2 below, a large share of unskilled and medium-skilled factor groups are included in the subsidy programme initially simulated in the CGE model. In the micro-simulation model, then, where individual beneficiaries are identified, explicit targeting assumptions are imposed. For example, in one of the scenarios only youth participants are selected for employment. It should be noted though that the focus in this analysis is mainly on welfare outcomes under different assumptions about the wage elasticity of demand and

different financing options under both a short and long run context rather than on targeting issues and options.⁷⁶

Once again, the use of a general equilibrium approach improves on a partial equilibrium analysis in that both the direct and indirect effects of wage subsidy schemes are considered. As with the minimum wage simulations, we expect wage subsidy programmes to affect household disposable income levels. This may happen directly as a result of the increase in the number of employment opportunities. Since the wage subsidy effectively acts as a production subsidy prices may decline, which further increases the spending power of households. The downside, however, is that financing is required, and whether financing is raised via a tax on income or a tax on capital (see section 2.2) will ultimately impact negatively on households' disposable income levels. The advantage of the CGE model is that all these implications are accounted for within a single, consistent framework.

2.2. Description of Simulations and Financing Options

The aim of these simulations is to explore the impact of hypothetical wage subsidy scenarios under a range of wage elasticity levels and for different financing options. As before with the minimum wage scenarios, results are produced for wage elasticities ranging from $\eta = 0.3$ to $\eta = 2.0$, with $\eta = 0.7$ considered the benchmark. In all the scenarios a short- and long run closure is modelled whereby capital stock is either locked down within sectors in the short run or assumed to be mobile across sectors in the long run. Obviously these simulations, although hypothetical at this stage, need to be set up with some provisional budget parameters in mind. The *Budget Review 2007* figures suggest that a wage subsidy programme could cost anything between R20 and R30 billion per annum (National Treasury, 2007). More recent media reports seem have settled on an amount of between R25 and R30 billion⁷⁷, which are the numbers we base our simulations on.

The overall subsidy cost is determined by several factors, including the wage elasticity of demand (a greater elasticity means more subsidised employment opportunities are created), the workers or industries that are targeted and the subsidy amount per worker. Given model limitations only a general subsidy (as opposed to a marginal one) can be modelled. Such a scheme is also necessarily more expensive than a marginal programme given that all existing workers are subsidised. Importantly, though, this has indirect implications due to the fact that production costs are effectively subsidised by such a general subsidy, which in turn may have

⁷⁶ This does not mean to say that considerations about the outcomes under different factor group and industry targeting schemes are unimportant. Such targeting options is a key theme in an earlier paper by Pauw and Edwards (2006).

⁷⁷ See for example <http://www.busrep.co.za/index.php?fArticleId=3698305&fSectionId=552&fSetId=662>, and <http://www.pmg.org.za/report/20080222-2008-budget-national-treasury-briefing>.

indirect consumption demand and employment effects. For this reason a general equilibrium model is appropriate.

The simulations here assume a fairly widely targeted wage subsidy scheme. The same target group is maintained in all the CGE simulations to allow for an increased focus on the outcomes of a given wage subsidy programme under alternative assumptions about the wage elasticity and financing options. Youth targeting is, however, considered more explicitly in the micro-simulation model. Typically wage subsidy schemes are targeted at workers with limited or no work experience and poor employment prospects. Therefore, in the simulations here, only factor groups classified as unskilled or medium-skilled in the CGE model are targeted. There are 88 factor groups in the SAM, of which the unskilled and medium-skilled groups make up 22 and 46 respectively.

If implemented, a wage subsidy scheme is likely to only be targeted at workers earning less than R45 000 per annum (in 2007 prices) (National Treasury, 2007). R35 000 is chosen as a roughly comparable threshold in 2000 prices. While all low-skilled workers in the SAM are below this threshold, about half the medium-skilled occupation categories were found to have an average wage exceeding this value and were hence excluded from the target group. This leaves 45 low-skilled labour groups in the target group. Incidentally, all these groups are Black (African, Coloured or Asian); hence White workers are implicitly excluded from the target group.

These targeted factor groups represent 7.3 million workers, or about two-thirds of the workforce. These workers are employed across all the sectors, not all of which are necessarily suitable for targeting. Therefore, following Go et al. (2009) the mining sectors are excluded. Government is also excluded based on the belief that employment is not determined by profit maximising behaviour in this sector. Utilities (electricity and water) are also excluded since the lines between government and the private sector are blurred in such network industries. A wage subsidy to private households may be effective, but administration of the subsidy through the tax system (the preferred method for disbursement in normal commercial sectors) would be difficult. Hence, private households (domestic workers) are also excluded from the programme. Finally, of the manufacturing sectors, all the 'heavy manufacturing' industries are excluded. These sectors are typically more capital-intensive than labour intensive 'light' manufacturing industries and may as a result be less likely to be responsive to a wage subsidy programme (see Pauw and Edwards, 2006).⁷⁸

⁷⁸ Sector-specific wage elasticity levels assumed for this study are shown in Appendix Table 5. We do in fact assume the same responsiveness to wages across all manufacturing sectors.

The sectors that remain in the target group include agriculture, food products, beverages and tobacco, textiles, leather, wood and paper, construction and building, trade services, accommodation, transport and communication, and financial and business services. The inclusions of the agricultural sector may seem an interesting choice, given that this sector (as is the case with the mining sector) has been in a long-run decline as far as employment levels are concerned. The inclusion is, however, motivated by at least two considerations. Firstly, the agricultural sector remains one of the largest employers of rural-based low-skilled workers in South Africa. As shown in Chapter 2 poverty and unemployment are rife in rural areas, and hence the poverty-reducing effects of a wage subsidy programme in agriculture might be significant. A second reason why an agricultural wage subsidy makes sense is that it may curb rural-urban migration that may increase as a result of a firm-side wage subsidy in manufacturing and services sectors. Most rural-urban migration is from non-homeland rural areas where employment opportunities on commercial farms are declining.

Industry targeting reduces the number of workers in the target group to 4.1 million people (or about one-third of employment). Since a general subsidy is modelled, employers of these 4.1 million workers immediately receive a windfall gain equal to the subsidy per worker multiplied by the employment of targeted occupation groups. Typical occupation groups that remain in the target group after excluding several sectors include medium, semi- and unskilled occupations such as services and sales workers, craft and trades people, machine and plant operators, agricultural workers and elementary occupations.

A wage subsidy value of R4 200 per annum (2000 prices) or 50 per cent of the value of the annual wage, whichever is less, is set for all targeted workers.⁷⁹ Although this value is set arbitrarily, it translates to about R6 000 in 2007 prices or R500 per month, which is close to the annual wage subsidy value of R5 000 used by Levinsohn (2008) in his illustrative examples. Given average wage levels of targeted workers across the various sectors and the fact that subsidies are capped, the effective ad valorem wage subsidy differs across targeted sectors. These values are shown in Table 6.1.

⁷⁹ The subsidy is modelled in the CGE model by calculating a factor use subsidy (a negative factor use tax) that is equivalent to a lump-sum subsidy of R4 200, i.e. the average wage of each targeted occupation group in each targeted industry is taken into consideration. If the wage is less than R8 400, the wage subsidy is capped at 50 per cent of the value of the wage.

Table 6.1: Effective Average Wage Subsidies by Sector

	Effective subsidy for unskilled workers	Effective subsidy for medium- skilled workers	Effective subsidy for all low- skilled workers	Sectoral average subsidy
<i>Wage subsidy targeted sectors</i>				
Agriculture	40.5%	33.0%	37.8%	36.6%
Food products	24.2%	16.2%	19.3%	16.5%
Beverages and tobacco	19.5%	19.1%	19.2%	15.8%
Textiles	22.8%	25.9%	25.5%	22.6%
Leather Wood and Paper	20.8%	16.8%	17.7%	15.1%
Construction and Building	21.1%	19.4%	19.8%	19.0%
Trade services	25.5%	14.7%	19.1%	15.6%
Accommodation	25.5%	21.6%	22.2%	18.3%
Transport and communication	18.5%	10.9%	12.2%	8.6%
Financial and business services	27.5%	12.4%	16.1%	7.6%
<i>Other sectors</i>	0.0%	0.0%	0.0%	0.0%
Economy-wide average	13.8%	11.6%	12.5%	9.8%

Source: IES/LFS 2000 and author's own calculations.

The wage subsidy level is further chosen because, given the targeting mechanism devised, it yields a total wage subsidy cost of between R18 and R23 billion (2000 prices) for wage elasticity levels of $\eta = 0.3$ and $\eta = 1.0$ respectively. This is equivalent to R27 and R33 billion in 2007 prices if converted using Statistics South Africa's CPI. At the benchmark elasticity level of $\eta = 0.7$ the subsidy cost (in 2007 prices) is expected to be around R30 billion, which is the upper bound of National Treasury's possible costs range. These estimates are derived from the CGE model, so in effect we worked backwards in determining the targeting mechanism and subsidy values in setting up the simulations in such a manner that they would ultimately yield these overall costs. Table 6.2 further below in the results section provides further details.

As for the financing of the wage subsidy scheme, the assumption here is that government needs to raise additional revenue through taxes in order to maintain the budget deficit of the base. This is referred to as a revenue neutral budget closure. Since the subsidy raises employment and value added, some of the subsidy cost will be recovered through increased tax revenue from existing tax instruments. However, additional financing will still have to be raised. Two such financing options are considered. The first is a tax on capital stock employed in those industries targeted by the wage subsidy. The rationale of such a tax is to enhance the substitution of capital for low-skilled workers further (as proposed by Heintz and Bowles, 1996).

There are several design options, only one of which is implemented here. The first is to tax all capital employed in the economy. This would induce a general shift away from capital

intensity across all sectors, which is not necessarily something that can be explored in a satisfactory manner in a comparative static model. A second is to tax capital only in those sectors not targeted by the wage subsidy scheme, or perhaps those non-targeted sectors that are fairly capital-intensive sectors (e.g. ‘heavy manufacturing’ sectors). The rationale in this instance would be to induce a sectoral shift away from such capital-intensive sectors towards labour-intensive sectors in the long run. The third, and the option selected in this study is to only tax capital in those sectors that are targeted by the wage subsidy scheme. This choice is motivated by the fact that, firstly, taxation of capital in non-targeted sectors may seem unreasonable towards capital-intensive sectors, many of which contribute substantially to South Africa’s GDP, and secondly, that we wish to evaluate the ‘enhanced substitution’ effects that such a financing option might induce. It also ensures revenue neutrality ‘within’ the subsidised firm rather than a reliance on external parties (such as households through income taxes, or non-targeted sectors through capital taxes) to finance the scheme.

Although theoretically the idea of a capital tax makes sense, it is fairly difficult to interpret CGE results due to problems around the measurement of returns to capital. Capital returns in this particular South African CGE model includes both returns to human and physical capital, i.e. some form of self-employment income or entrepreneurial rewards is also included. Returns to capital (from the perspective of the owners of capital) should therefore be thought of as ‘mixed income’ rather than income purely from physical capital stock such as machinery and equipment.⁸⁰ A more appropriate tax measure would have been a tax on the value of physical capital stock employed, but since this information is not available in SAM the capital tax financing simulations are more of academic interest.

The second financing option is a more orthodox approach whereby income tax rates are raised. Although several income and profit tax instruments exist in the model, we assume that only private household income taxes are raised, and by the same proportion across all household groups. Household income tax rates in the CGE model are average as opposed to marginal tax rates, and hence the results will show the percentage by which the average tax rate of households would have to increase in order to raise enough additional revenue to finance the shortfall in the budget. Typically, given the progressive tax system in this country, wealthier households have higher average tax rates, and hence these households will be responsible for financing the bulk of the subsidy cost.

As with the minimum wage scenarios the focus here is on illustrating the sensitivity of model outcomes to different wage elasticity levels. While we acknowledge and argue that indirect

⁸⁰ This ‘problem’ is particularly severe in agriculture where farmers’ income consists of a mix of returns to land, physical capital and human capital, all of which is collectively reported in the national accounts (and household surveys) as income from ‘gross operating surplus’ (GOS) income.

demand effects (and hence income and price elasticities) are important, testing the model's sensitivity in this regard is beyond the scope of these analyses. All simulations are conducted using the same set of income and price elasticities as those used in the minimum wage scenarios.

2.3. Results and Analysis

2.3.1. Financing Effects

Table 6.2 shows the financing costs in billions of Rands, first in 2000 prices and then in 2007 prices. As explained earlier, the wage subsidy values and targeting mechanism was devised specifically to ensure that the overall cost of the scheme would fall approximately within the range of R25 to R30 billion in 2007 prices. These costs are realised at elasticity values ranging between $\eta = 0.3$ and $\eta = 0.7$. Rising costs at higher wage elasticities relate to higher employment effects. Employment results are shown below.

Table 6.2: Financing Costs of the Wage Subsidy Programme under Alternative Assumptions

		2000 prices (Rbn)				
		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Short run	Tax capital stock	18.8	19.8	20.8	22.5	29.2
	Tax personal income	19.1	20.1	21.2	22.9	29.6
Long run	Tax capital stock	18.5	19.6	20.8	22.6	29.4
	Tax personal income	18.5	19.6	20.8	22.6	29.5
		2007 prices (Rbn)				
		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Short run	Tax capital stock	26.9	28.4	29.9	32.3	42.0
	Tax personal income	27.3	28.8	30.4	32.8	42.5
Long run	Tax capital stock	26.5	28.1	29.8	32.4	42.2
	Tax personal income	26.5	28.2	29.8	32.4	42.3

Note: The cost estimates for 2000 are from the CGE model, while 2007 estimates are obtained using the standard CPI series produced by Statistics South Africa.

Source: CGE/micro-model results

Table 6.3 reports on the specific changes in tax instruments that are necessary in order to generate the required revenues. Since no capital tax exists in the base of the model, the capital tax results show the actual rates that need to be set. The results pertaining to the income tax instrument should be interpreted as the required percentage point increase in the base-level average income tax rate of households. The short- and long run results are fairly similar, although the slightly larger employment effects in the long run (see section 2.3.2) imply that more financing is required. At the benchmark elasticity of $\eta = 0.7$ a capital use tax of around 10 per cent (ad valorem) is required, or, alternatively, an increase in the average household income tax rate of about 20 per cent will balance the budget.

Table 6.3: Required Capital Tax Rates or Income Tax Rate Increases

		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Short run	Capital tax financing (actual rate to be set)	8.3%	9.0%	9.7%	10.8%	15.2%
	Income tax financing (increase in base rate)	17.3%	18.5%	19.7%	21.6%	28.4%
Long run	Capital tax financing (actual rate to be set)	8.7%	9.3%	10.0%	11.1%	16.2%
	Income tax financing (increase in base rate)	17.8%	18.9%	20.0%	21.7%	28.5%

Note: The results shown for income taxes represent the required increase in the average tax rate that would generate enough additional financing to cover the subsidy costs shown in Table 6.2 taking into account changes in government revenue from all sources.

Source: CGE/micro-model results

Further below a strong case is developed in favour of the income tax approach over the capital tax approach. A further look into the real impact of a 20 per cent increase in average income tax rates is therefore useful for putting this result into context. According to the SAM data used in this study the poorest one-third⁸¹ of households spent an average of 3.5 per cent of their income on income taxes, compared to 7.0 per cent for the middle one-third and 16.2 per cent in the top one-third. A 19.7 per cent increase (short run, $\eta = 0.7$) therefore implies that these rates would now increase to 4.2, 8.4 and 19.4 per cent respectively. In the third group this translates into an increase in the monthly tax bill of just over R200 for the average adult in the household, which equates to 3 per cent of the average adult's earnings of about R6 667 per month (2000 prices). For those in the bottom two groups, the monthly marginal tax contributions would have to be R5 and R23 per month respectively. For both these groups that represents about 1 per cent of the gross monthly income of an adult (R667 and R1 667 respectively). From the above it is clear that a very large share of the tax burden would be carried by those in the wealthiest income group, which is understandable given low earnings and tax collection rates in the poorer groups.

2.3.2. Employment and Production Effects

a) Introductory Remarks

We next turn to the employment results generated by the CGE model. Table 6.4 shows the outcomes for low-skilled and skilled workers and for various wage elasticity values under a short run closure. Table 6.5 shows the same results under the long-run closure. Results are shown separately for the targeted industries, while the non-targeted sectors are grouped together under the category 'other sectors'. The employment results differ marginally for

⁸¹ The SAM household groups are once again grouped into three segments of equal size as was done earlier in the reporting of minimum wage simulation results.

different financing and closure options, but vary greatly depending on the wage elasticity level. On average, about 500 000 low-skilled jobs are created in the low elasticity case ($\eta = 0.3$) compared to one million when $\eta = 0.7$ and 1.5 million when $\eta = 1.0$. At the benchmark elasticity this represents a 12 per cent increase in low-skilled employment.

b) Programme Effectiveness: Cost per Job Estimates

Relatively speaking, the overall programme cost only rises marginally as the wage elasticity levels increases. Employment gains, however, rise dramatically. This is an indication that the efficiency of the programme – measured here in terms of programme cost per job generated – is greatly enhanced at higher wage elasticity values. When $\eta = 0.7$ is the cost per job is about R20 000, while it is almost double that when $\eta = 0.3$ (see Appendix Table 9). Incidentally, the average wage of targeted workers is about R18 000 per annum (see Appendix Figure 3), and hence even at the benchmark wage elasticity it will still be more expensive to create a job through this policy than to give an unemployed person a welfare grant equivalent to the wage he or she might expect to earn if employed on the programme. However, this does not mean to say that welfare grants will be more effective at reducing poverty; in fact, as illustrated in Pauw and Edwards (2006), the multiplier effects of increased employment are important and ultimately mean that the welfare effects of a wage subsidy programme will exceed that of a welfare programme with a similar budget.

The high cost per job estimates also relate closely to the fact that the subsidy is modelled as a general subsidy. This implies that a large share of subsidised workers was already employed prior to the subsidy being implemented (about 4.3 million workers). If this were a marginal subsidy the cost per job created would be equal to average subsidy per worker, which in these simulations equals about 12.5 per cent of the wage (see Table 6.1) rather than over 100 per cent.

Table 6.4: Employment Results: Short Run Scenarios

	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Low-skilled employment										
Agriculture	96,314	159,801	228,455	336,687	745,997	96,790	160,631	229,696	338,633	751,096
Food products	12,446	20,870	29,493	42,948	94,683	12,553	21,044	29,731	43,278	95,301
Beverages and tobacco	3,316	5,681	8,186	12,236	28,909	3,344	5,728	8,253	12,335	29,136
Textiles	47,733	73,446	96,537	128,920	238,795	48,103	74,017	97,271	129,852	240,225
Leather Wood and Paper	11,488	19,397	27,578	40,457	90,334	11,577	19,540	27,774	40,729	90,848
Construction and Building	67,007	104,261	138,227	185,885	340,567	66,256	103,037	136,557	183,572	336,018
Trade services	137,368	229,266	322,949	468,684	1,025,681	138,059	230,352	324,390	470,613	1,029,043
Accommodation	31,156	53,474	77,124	115,264	269,453	31,284	53,697	77,449	115,758	270,728
Transport & communication	15,580	26,632	38,334	57,204	133,241	15,810	26,998	38,824	57,868	134,439
Financial and business services	22,169	39,130	57,860	89,375	228,879	21,728	38,373	56,766	87,729	224,764
Other sectors (non-targeted)	8,081	19,187	34,368	62,910	197,314	-2,930	7,179	21,525	48,889	179,295
Net change	452,658	751,144	1,059,111	1,540,570	3,393,853	442,575	740,594	1,048,236	1,529,256	3,380,893
<i>Percentage change in overall low-skilled employment</i>	<i>5.2%</i>	<i>8.7%</i>	<i>12.2%</i>	<i>17.8%</i>	<i>39.2%</i>	<i>5.1%</i>	<i>8.6%</i>	<i>12.1%</i>	<i>17.7%</i>	<i>39.1%</i>
Skilled employment										
Agriculture	487	714	894	1,063	839	507	746	939	1,127	964
Food products	229	280	277	195	-507	257	324	335	273	-377
Beverages and tobacco	14	8	-6	-34	-170	24	24	16	-4	-114
Textiles	2,663	3,426	3,722	3,650	1,531	2,715	3,504	3,819	3,770	1,695
Leather Wood and Paper	187	251	285	292	57	213	292	339	365	184
Construction and Building	949	1,112	1,055	711	-1,451	930	1,083	1,017	664	-1,512
Trade services	3,869	4,507	4,109	2,036	-13,307	4,142	4,929	4,659	2,755	-12,138
Accommodation	1,089	1,667	2,144	2,670	2,806	1,135	1,743	2,248	2,815	3,090
Transport & communication	-168	-415	-661	-979	-1,465	-10	-169	-337	-549	-729
Financial and business services	-1,881	-2,515	-2,645	-2,051	4,755	-2,168	-2,997	-3,324	-3,020	2,852
Other sectors (non-targeted)	-7,437	-9,035	-9,173	-7,553	6,912	-7,745	-9,478	-9,711	-8,196	6,085
Net change	0	0	0	0	0	0	0	0	-0	0

Source: CGE/micro-model results

Table 6.5: Employment Results: Long Run Scenarios

	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Low-skilled employment										
Agriculture	118,273	182,469	247,454	346,416	721,003	129,095	198,110	267,172	371,325	761,421
Food products	12,565	19,468	27,024	39,494	91,922	16,846	23,752	31,316	43,778	95,519
Beverages and tobacco	1,827	4,104	6,561	10,602	27,845	3,520	5,812	8,295	12,362	29,377
Textiles	76,739	92,366	108,090	132,833	229,953	80,063	97,168	113,903	139,964	242,374
Leather Wood and Paper	10,141	17,277	24,728	36,683	85,065	15,109	22,556	30,279	42,602	91,922
Construction and Building	88,350	112,931	138,338	178,378	331,481	97,717	122,589	148,277	188,677	342,707
Trade services	151,334	232,244	318,567	459,621	1,054,435	171,116	251,344	336,502	474,784	1,046,594
Accommodation	43,490	62,499	82,125	113,734	244,317	58,071	79,371	100,973	135,540	278,797
Transport & communication	3,994	15,436	27,662	47,455	128,089	14,381	25,837	38,094	57,830	136,166
Financial and business services	13,453	31,993	52,090	85,369	230,926	18,026	36,266	55,924	88,206	225,450
Other sectors	29,214	42,695	57,222	79,888	151,629	-25,920	-10,779	8,466	41,470	178,958
Net change	549,380	813,481	1,089,862	1,530,473	3,296,665	578,024	852,027	1,139,200	1,596,536	3,429,285
<i>Percentage change in overall low-skilled employment</i>	<i>6.3%</i>	<i>9.4%</i>	<i>12.6%</i>	<i>17.7%</i>	<i>38.1%</i>	<i>6.7%</i>	<i>9.8%</i>	<i>13.2%</i>	<i>18.5%</i>	<i>39.6%</i>
Skilled employment										
Agriculture	1,114	1,337	1,403	1,337	544	1,375	1,708	1,846	1,846	1,101
Food products	234	71	-56	-212	-555	858	658	490	268	-424
Beverages and tobacco	-275	-284	-287	-286	-212	41	18	1	-24	-106
Textiles	5,748	5,365	4,891	4,112	1,260	5,982	5,718	5,299	4,563	1,747
Leather Wood and Paper	-75	-97	-132	-188	-317	681	669	631	555	234
Construction and Building	1,810	1,465	1,103	540	-1,444	2,098	1,737	1,355	755	-1,404
Trade services	6,442	5,148	3,747	1,535	-6,265	9,406	7,652	5,670	2,395	-10,823
Accommodation	3,416	3,350	3,124	2,656	447	5,933	6,113	6,034	5,716	3,817
Transport & communication	-4,796	-4,661	-4,450	-4,015	-1,387	-982	-1,026	-1,014	-956	-609
Financial and business services	-10,933	-9,299	-7,431	-4,248	10,590	-7,464	-6,474	-5,425	-3,800	2,113
Other sectors	-2,686	-2,396	-1,912	-1,231	-2,660	-17,927	-16,773	-14,886	-11,319	4,356
Net change	0	0	0	0	0	0	0	0	0	0

Source: CGE/micro-model results

The above issue does raise questions around affordability and efficiency of general versus marginal subsidy programmes. The important point to remember, though, is that a general subsidy is in effect both a marginal wage subsidy and a production subsidy combined. The marginal wage subsidy component has a certain direct employment effect, which in a partial equilibrium framework can be calculated as the wage elasticity multiplied by the percentage decline in the wage.⁸²

This is shown in Table 6.6 below. In this table employment calculations are done in the same way as in Table 5.7 before (for the minimum wage case), i.e. percentage changes in sectoral wages as reported in Table 6.1 are multiplied by sector-specific wage elasticity values shown in Appendix Table 5. The production subsidy component is the lump sum gain received by firms that already employ subsidised workers in the base, i.e. even if they do not increase employment, the subsidy still reduces their production costs. Under the assumption of a well-functioning product market, these production cost savings are passed on to consumers in the form of lower prices, which implies an indirect increase in consumption demand and hence employment. The CGE model further accounts for the negative effects of having to raise finance through income or capital taxes, but despite this, the net employment effect in this model is almost double that of the partial equilibrium model.

Table 6.6: Comparison of Job Gains in Partial and General Equilibrium Models

	Simulation elasticity value			
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$
Partial equilibrium model job gains	235,201	392,002	548,802	784,003
CGE model job gains (short-run scenario, income tax financing)	442,575	740,594	1,048,236	1,529,256
Exchange rate appreciation (short-run scenario, income tax financing)	0.26%	0.33%	0.41%	0.53%

Source: CGE/micro-model results

Since the CPI is the numéraire in the model, all prices are pegged to the inflation basket. It is therefore not possible to show directly what the impact of wage subsidies is on prices in the economy other than to show how this effect is revealed in greater job gains (as in the table above) or demand-side shocks. However, an alternative option is to show how a wage subsidy, which effectively acts as a domestic production subsidy, causes the exchange rate to appreciate. The model results show that the currency appreciates by between 0.26 and 0.53 per cent as a result of wage subsidies (Table 6.6).

⁸² In fact, in a partial equilibrium framework the (direct) employment effect of a marginal and general subsidy will be the same since the decision about employment takes place ‘at the margin’ only, i.e. at the point where the marginal cost of an additional worker (i.e. the subsidised wage) is equal to the marginal revenue product (see Chapter 3).

The above illustrates, once again, the importance of taking into account direct and indirect effects when contemplating the impact of policy. Also, while a marginal subsidy may seem more effective as measured in terms of the cost per job generated, a large portion of the cost per worker under the general subsidy is in fact a price subsidy that directly benefits poor consumers and not only those households that gain employment. An important consideration is whether firms do in fact reduce prices as the model suggests. Existence of market power may suggest otherwise. This issue is revisited in Chapter 7.

c) Low-Skilled Employment and Financing Options

Returning now to the detailed employment results for low-skilled workers (Table 6.4 and Table 6.5) it is evident that the employment effects are larger in the long run. This is expected given the greater flexibility afforded by capital mobility in the long run. The wage subsidy allows subsidised producers to lower production costs and commodity prices, thus causing demand for their output to increase. In the long run capital is attracted to these subsidised sectors, thus allowing subsidised sectors to increase the scale of production and hence employment further (sectoral production effects are considered later in this section).

However, whereas the capital tax financing option generates slightly more favourable employment results for low-skilled workers than the income tax financing option in the short run, this is no longer the case in the long run. This is an important result that needs explaining. In the short run the capital tax enhances the substitution effect through the introduction of an additional factor price distortion, thus explaining the superior employment effects under this financing option. However, in the long where capital stock is mobile across sectors the capital tax actually deters capital stock from being attracted to the subsidised sectors simply because the tax reduces the returns to capital in those sectors. Thus, in this instance the income tax financing option is preferable from an employment-generation perspective.

The above result raises some important questions around capital use taxes as a financing option for a wage subsidy programme. Although the variant of the CGE model used here is not dynamic, the long run closure does allow for some insight into the likely sectoral shifts that such a capital tax might bring about.⁸³ The results here show that a capital tax imposed on capital used in wage subsidy sectors will in the long run tend to divert capital stock

⁸³ In a dynamic model the long run process whereby current savings are converted into changes in future capital stock levels (and hence production capacity) is explicitly modelled in an inter-temporal framework. In a static model, processes of capital accumulation and depreciation in the long run are imitated by allowing capital stock levels to vary at an industry-level. Thus, although the model does not allow for a net increase in the production capacity or an outward shift in the production possibility frontier, it is possible to consider which sectors are more likely to attract future investments given changes in sectoral returns to such investments.

investments away from these wage subsidy sectors, thus ultimately reducing the employment capacity in these sectors. An unintended consequence in this ‘constant production possibility frontier closure’ (see footnote 83) is that capital will instead be attracted to non-targeted sectors that are already relatively more capital-intensive.

The detrimental long run effects of a capital tax suggest that alternative financing options should be used. Pollin et al. (2006) in fact denounce the idea of a capital tax and instead propose that capital should rather be *subsidised* as part of a broader employment promotion programme that aims, ultimately, to enhance the overall capacity of sectors to employ more people. The alternative capital tax options mentioned earlier (but not modelled here) will all have similar unintended consequences for the employment capacity in the economy. These results illustrate how easily policy lessons can be misinterpreted when all factors – in this instance the short *and* long run effects – are not fully taken into account.

The more orthodox financing method of raising income taxes could therefore be considered more appropriate. This conclusion is further supported when considering the household income distributional effects later in section 2.3.2, but it should already be evident from the employment results above that capital taxes tend to impact negatively on all forms of employment in the long run as it lowers the production capacity in taxed sectors. Returns to capital are furthermore an important income source to households across the income spectrum.⁸⁴ As the returns to capital decline due to the tax (see directly Table 6.7 below), all households are affected similarly, irrespective of where they are located in the income spectrum. Income taxes are more progressive and allow for a scenario where a disproportionate share of the burden is carried by wealthier households. This suggests that the income tax scenario is also preferable from a purely distributional point of view, also in the short run.

d) Low-Skilled Employment and the Labour Market Closure

Any simulated policy shock that predicts employment gains in excess of one million (when $\eta = 0.7$) – an increase of almost 10 per cent in the overall workforce – requires careful consideration of the underlying assumptions. Apart from the fact that this might be an optimistic wage elasticity levels, two further issues around the labour market closure selected for low-skilled workers are of interest.

Firstly, the assumption that there is an excess supply of low-skilled workers available to satisfy such a large increase in labour demand needs to be carefully scrutinized. A large part of the unemployment problem has been described as a structural one in the sense that the

⁸⁴ The SAM suggests that it represents 13 per cent of income in both the bottom and middle one-third of household groups, and 14 per cent in the top one-third.

unemployed lack the skills required to be gainfully employed. The predicted increase in employment should, however, be seen in context of a very large pool of unemployed people from which employers can choose candidates. There were approximately 3.86 million active jobseekers plus a further 2.35 million inactive jobseekers in 2000. Even if all the inactive jobseekers were considered unemployable, the simulation still means that only about one-quarter of active jobseekers (i.e. those defined as unemployed under the narrow definition) would have to be considered employable. These employment changes are marginal compared to the sheer number of unemployed persons in the country.

What is important, though, and this relates to a second feature of the particular closure for low-skilled workers, is the assumption that their wage levels will be unaffected even in the face of a large increase in labour demand. This relates to the assumption that labour supply is infinitely elastic. As shown earlier in Chapter 3, an inelastic labour supply curve would mean that at least some of the wage subsidy is captured by workers in the form of higher wages, an outcome that is quite likely in industries where wage bargaining takes place and labour unions are strong. This reduces the employment effect as part of the wage subsidy becomes a direct transfer to workers in the form of higher wages. In this context the employment gains shown in CGE model should be considered the upper bound of the potential employment gains under such a programme.

At the extreme, the entire wage subsidy might be captured by workers. Results generated by Pauw (2002) in a standard CGE model show that such a scenario will lead to virtually no employment gain as employers have no incentive to do so given that the wage they face remains the same when the subsidy is captured by workers in such a manner. The small changes in employment that are observed are due to indirect demand effects arising from the fact that subsidised workers now earn higher wages and hence consume more. A similar effect might be observed when a wage subsidy is payable directly to workers and strong unions or the existence of minimum wages prevent average wages from falling (Pauw, 2002).

e) Is There Evidence of Unintended Labour Market Substitution Effects?

Table 6.4 and Table 6.5 above also present employment results for skilled workers. Since this class of labour remains fully employed in terms of the labour market closure adopted, the net employment effect is zero. Often a concern of wage subsidies is that they create unintended substitution effects where unsubsidised workers (in this instance all skilled workers and some non-targeted low-skilled workers) are substituted for subsidised workers. Such substitution effects are in fact observed in some of the targeted sectors, and especially in the long run scenarios. For example, under the income tax financing scenario just under 6 500 skilled jobs are lost in the transport and communication and financial and business services sectors. However, most of the decline in labour demand takes place in the non-targeted sectors, with

almost 15 000 skilled jobs lost in these sectors in the same simulation. This suggests that scale effects within targeted sectors in fact dominate the substitution process, which allows targeted sectors to generally increase demand for both subsidised (low-skilled) and unsubsidised (skilled) workers.

There is also the question of substitution among low-skilled workers. This is a concern when (a) the subsidy is a marginal subsidy only available to newly appointed workers and not incumbents, or (b) when the subsidy is only available for a short period of time and subsidised workers are replaced by newcomers once the subsidy period comes to an end ('churning') (see Chapter 3). Neither of these effects can be studied here since we model a general subsidy (rather than a marginal one) and also do not consider the subsidy period explicitly.

In the absence of concrete results on the matter, we can only speculate, but the fact that we observe fairly large scale (production) effects due to the wage subsidy programme seems to suggest that such unintended substitution effects will be fairly unlikely to happen. Evidence further suggests that the currently employed have higher predicted employment probabilities, which relates to the level of experience they have relative to the unemployed (see for example Figure 4.6). It is therefore unlikely that firms will replace incumbents regardless. In fact, this same argument may be used to support a less costly (albeit more administratively intensive) marginal subsidy programme as opposed to a general one.

In Chapter 2, labour market rigidity, and particularly the administrative burden associated with firing people in this country, was highlighted. Firms will therefore weigh up the cost of churning against the savings on their wage bill before deciding to replace an incumbent with a subsidised worker. It has also been argued in Chapter 3 that a longer subsidy period will lead to less churning in the labour market.

f) Factor Incomes

We next turn to a brief review of the changes in total factor incomes observed for these simulations, as shown in Table 6.7 below. Unskilled and medium-skilled labour income increases considerably in all the scenarios. As the wage elasticity increases, more jobs are created and thus total wage income increases despite the fact that average wage earnings remain constant in terms of the labour market closure for low-skilled workers. Skilled workers also gain in all the scenarios, which suggests that the subsidy causes overall demand and hence average wages of skilled workers to increase. This substantiates the claim above that scale effects dominate the substitution effects of the wage subsidy in both the short- and long run. As expected, returns to capital decline in all the capital tax financing scenarios.

g) Sectoral Production Effects

The sectoral production results in Table 6.8 reiterate many of the points made in the preceding sections. Capital tax financing in the short run ensures a greater net production effect. At the benchmark elasticity of $\eta = 0.7$, the increase in overall activity output is 1.7 per cent in this scenario, compared to 1.2 per cent in the income tax financing scenario. Those sectors targeted by the wage subsidy generally experience greater output gains. In a demand-driven static model these sectoral shifts simply reflect changes in demand patterns due to changes in household disposable income levels and relative price changes.

In the long run the capital tax financing option is not as favourable as the income tax scenario. This is particularly evident in the transport and communication and financial and business services sectors where output levels in fact decline despite the fact that low-skilled wages in these sectors are subsidised. This is due to the detrimental effect of capital taxes on production costs (demand-side effect), which also leads to an outflow of capital stock and a decline in production capacity in these sectors. Under the long run income tax scenario capital is actually attracted to the wage subsidy sectors, thus enhancing the output and employment effects. For example, fairly large gains are observed in the textiles (5 per cent) and accommodation (10.3 per cent) sectors.

Table 6.7: Changes in Factor Incomes: Short and Long Run Scenarios

Short run closure										
	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Unskilled labour	4.9%	8.2%	11.7%	17.1%	38.0%	4.8%	8.0%	11.5%	16.9%	37.7%
Medium-skilled labour	2.8%	4.7%	6.6%	9.4%	19.9%	2.8%	4.7%	6.5%	9.4%	19.9%
All low-skilled labour	3.3%	5.5%	7.8%	11.3%	24.3%	3.3%	5.5%	7.7%	11.2%	24.2%
Skilled labour	2.4%	2.7%	2.9%	3.2%	4.2%	2.2%	2.5%	2.8%	3.1%	4.1%
All labour	2.9%	4.1%	5.4%	7.3%	14.3%	2.8%	4.0%	5.3%	7.2%	14.2%
Capital	-1.8%	-2.2%	-2.5%	-3.0%	-4.7%	3.2%	3.2%	3.2%	3.3%	3.7%
Land	15.8%	14.7%	13.6%	12.0%	7.3%	16.2%	15.1%	13.9%	12.3%	7.7%
Total factor income	0.7%	1.2%	1.7%	2.5%	5.4%	3.0%	3.7%	4.3%	5.4%	9.3%

Long run closure										
	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Unskilled labour	5.8%	8.8%	11.9%	16.9%	37.1%	5.9%	9.0%	12.2%	17.4%	38.3%
Medium-skilled labour	3.7%	5.2%	6.9%	9.4%	19.1%	3.6%	5.3%	7.0%	9.7%	20.2%
All low-skilled labour	4.2%	6.1%	8.1%	11.2%	23.4%	4.2%	6.2%	8.2%	11.5%	24.5%
Skilled labour	2.2%	2.5%	2.7%	2.9%	3.5%	2.7%	2.8%	3.0%	3.3%	4.2%
All labour	3.2%	4.3%	5.4%	7.1%	13.5%	3.5%	4.5%	5.6%	7.4%	14.4%
Capital	-2.7%	-3.0%	-3.3%	-3.8%	-6.1%	2.7%	3.0%	3.2%	3.3%	3.8%
Land	34.3%	25.3%	19.4%	13.8%	5.6%	44.3%	33.0%	25.6%	18.6%	8.4%
Total factor income	0.6%	1.0%	1.4%	2.1%	4.3%	3.3%	3.9%	4.6%	5.6%	9.5%

Source: CGE/micro-model results

Table 6.8: Activity Output (Production Effects)

Short run closure										
	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Agriculture	1.1%	1.8%	2.6%	3.8%	8.0%	-0.0%	1.3%	2.0%	2.8%	4.0%
Food products	1.0%	1.7%	2.4%	3.5%	7.4%	0.0%	1.2%	1.9%	2.6%	3.7%
Beverages and tobacco	0.9%	1.5%	2.1%	3.0%	6.4%	0.0%	1.0%	1.7%	2.3%	3.2%
Textiles	2.1%	3.3%	4.5%	6.1%	11.7%	0.0%	2.3%	3.5%	4.7%	6.4%
Leather Wood and Paper	0.8%	1.4%	2.0%	3.0%	6.5%	0.0%	0.9%	1.5%	2.1%	3.1%
Construction and Building	0.8%	1.3%	1.8%	2.5%	5.3%	0.0%	0.5%	0.9%	1.4%	2.1%
Trade services	0.8%	1.4%	2.0%	2.8%	6.2%	-0.0%	0.9%	1.5%	2.1%	3.0%
Accommodation	2.3%	3.9%	5.4%	7.9%	16.7%	0.0%	2.4%	3.9%	5.5%	8.0%
Transport & communication	0.5%	0.9%	1.3%	2.0%	4.7%	0.0%	0.6%	1.0%	1.5%	2.1%
Financial and business services	0.6%	0.9%	1.3%	1.9%	4.3%	0.0%	0.4%	0.7%	1.0%	1.6%
Other sectors	0.5%	0.9%	1.3%	2.0%	4.6%	0.0%	0.6%	1.0%	1.4%	2.1%
Net change	0.7%	1.2%	1.7%	2.4%	5.4%	0.0%	0.7%	1.2%	1.7%	2.5%

Long run closure										
	Capital tax financing					Income tax financing				
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Agriculture	1.6%	2.3%	2.9%	3.7%	6.4%	-0.0%	2.4%	3.3%	4.1%	5.1%
Food products	1.2%	1.7%	2.2%	2.9%	5.7%	0.0%	2.0%	2.6%	3.2%	4.1%
Beverages and tobacco	0.6%	1.0%	1.4%	2.0%	4.0%	0.0%	1.8%	2.4%	2.9%	3.7%
Textiles	3.0%	3.6%	4.3%	5.3%	9.1%	-0.0%	4.1%	5.0%	5.8%	7.1%
Leather Wood and Paper	0.3%	0.8%	1.2%	1.9%	4.6%	0.0%	1.1%	1.7%	2.3%	3.2%
Construction and Building	0.9%	1.3%	1.7%	2.4%	5.2%	0.0%	0.4%	0.8%	1.2%	2.0%
Trade services	0.4%	0.8%	1.2%	1.9%	4.4%	0.0%	1.0%	1.5%	2.0%	2.9%
Accommodation	4.8%	5.7%	6.5%	7.5%	10.6%	0.0%	8.8%	10.3%	11.6%	13.4%
Transport & communication	-0.9%	-0.6%	-0.2%	0.3%	2.4%	-0.0%	0.2%	0.6%	1.1%	1.9%
Financial and business services	-0.8%	-0.5%	-0.1%	0.4%	2.2%	0.0%	-0.1%	0.3%	0.7%	1.4%
Other sectors	0.5%	0.9%	1.4%	2.1%	4.8%	0.0%	0.2%	0.5%	1.0%	1.7%
Net change	0.4%	0.8%	1.2%	1.9%	4.5%	0.0%	0.7%	1.1%	1.6%	2.4%

Source: CGE/micro-model results

2.3.3. Aggregate Household Income Changes

As before with the minimum wage results, aggregate changes in factor incomes largely dictate the observed changes in aggregate household income. However, an important difference between the earlier simulations and the wage subsidy simulations is the fact that the latter programme requires financing. The capital tax option impacts directly on gross household income levels due to its dampening effect on returns to capital stock owned by households. Under an income tax financing option the household effect is not observed at the level of gross household income, but rather at the after-tax disposable income level.

Although detailed income and poverty results are analysed in the following section, changes in disposable incomes of aggregated household groups are reported here. Thus, in Table 6.9 households are once again grouped into three ‘welfare’ groups by ranking the representative household groups by their average per capita incomes and splitting them into three groups of roughly similar size. Households in the bottom one-third (the poorest households) generally experience the greatest gain in disposable income, followed by households in the second and third groups. This relates to the fact that poorer households are more likely to be attached to low-skilled workers who gain most from the wage subsidy scheme, which in these simulations are specifically targeted at low-skilled, low-wage occupation groups.

Poorer household groups also pay lower taxes on average and are therefore not affected by rising income taxes under the income tax financing scheme to the same extent that wealthier household groups are affected. A further important result in this regard is that even though the capital and income tax financing options generate similar economy-wide disposable income changes, the distribution of these changes are very different. Raising income taxes as opposed to levying capital taxes ensures that the wage subsidy becomes a much more effective tool for redistributing income from wealthy to poorer households. The negative effects of capital taxes tend to be more equally distributed across households as it is of equal relative importance to households across the welfare spectrum.

Table 6.9: Changes in Aggregate Disposable Household Income

		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Short run closure	Capital tax financing					
	Bottom one-third	2.0%	3.6%	5.3%	8.0%	18.6%
	Middle one-third	1.7%	2.9%	4.2%	6.2%	13.4%
	Top one-third	0.4%	0.4%	0.4%	0.5%	0.6%
	All households	0.9%	1.5%	2.0%	2.9%	6.2%
	Income tax financing					
	Bottom one-third	2.9%	4.6%	6.4%	9.1%	20.0%
	Middle one-third	2.1%	3.3%	4.6%	6.6%	13.9%
	Top one-third	-0.4%	-0.4%	-0.4%	-0.5%	-0.6%
	All households	0.7%	1.2%	1.7%	2.6%	5.8%
Long run closure		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
	Capital tax financing					
	Bottom one-third	2.3%	3.8%	5.3%	7.7%	17.6%
	Middle one-third	2.0%	3.1%	4.2%	5.9%	12.4%
	Top one-third	0.0%	0.0%	0.0%	-0.0%	-0.5%
	All households	0.8%	1.3%	1.8%	2.5%	5.2%
	Income tax financing					
	Bottom one-third	3.4%	5.1%	6.7%	9.4%	20.2%
	Middle one-third	2.5%	3.7%	4.9%	6.8%	14.1%
	Top one-third	-0.3%	-0.3%	-0.3%	-0.3%	-0.5%
	All households	0.9%	1.4%	1.9%	2.7%	5.9%

Source: CGE/micro-model results

The above conclusion requires some further qualification. Earlier in section 2.2 it was explained that returns to capital as captured in the SAM includes income from both physical and human capital. It is reasonable to assume that lower-income households and those that are attached to informal employment opportunities own less physical capital stock than wealthier households. This implies that a greater portion of their ‘mixed’ income could be classified as returns to human capital or ‘entrepreneurial returns’. In reality a capital tax would be levied against the return on (or the value of) physical capital stock in an industry, and as such this tax measure is more likely to have a disproportional impact on wealthy households.

The fact that we are unable to distinguish between returns to human and physical capital in the underlying SAM probably means that the distributional estimates generated in the CGE model under the capital tax financing scenario are biased against poorer households. The extent of this bias is uncertain. Perhaps the most important lesson from this is the confirmation of just how difficult it would be to implement a capital tax measure given measurement problems.

2.3.4. Poverty and Distributional Effects at the Micro-Level

Once again two approaches to linking the CGE model results with micro-level models are followed here. The first is a simple micro-incidence model, while the second is a more elaborate micro-simulation model. We first present results from the micro-incidence model.

a) Micro-Incidence Model Results

In the minimum wage scenarios there was no need to raise additional financing for the policy programme, which meant that all tax rates stayed unchanged. In that instance it was appropriate to link changes in gross household income as generated in the CGE model with the micro-incidence model. In the wage subsidy context, however, a substantial amount of money is required to fund the programme. These funds are raised either through capital or income taxes. Whereas factor taxes are incurred by firms, household income taxes are levied against gross household earnings. Depending on the tax incidence in different household groups, the implication is that changes in the average income tax rate will cause gross income and net income changes to differ (they were the same in the minimum wage scenarios). From a welfare perspective it is therefore appropriate to consider the change in the after-tax income of households.

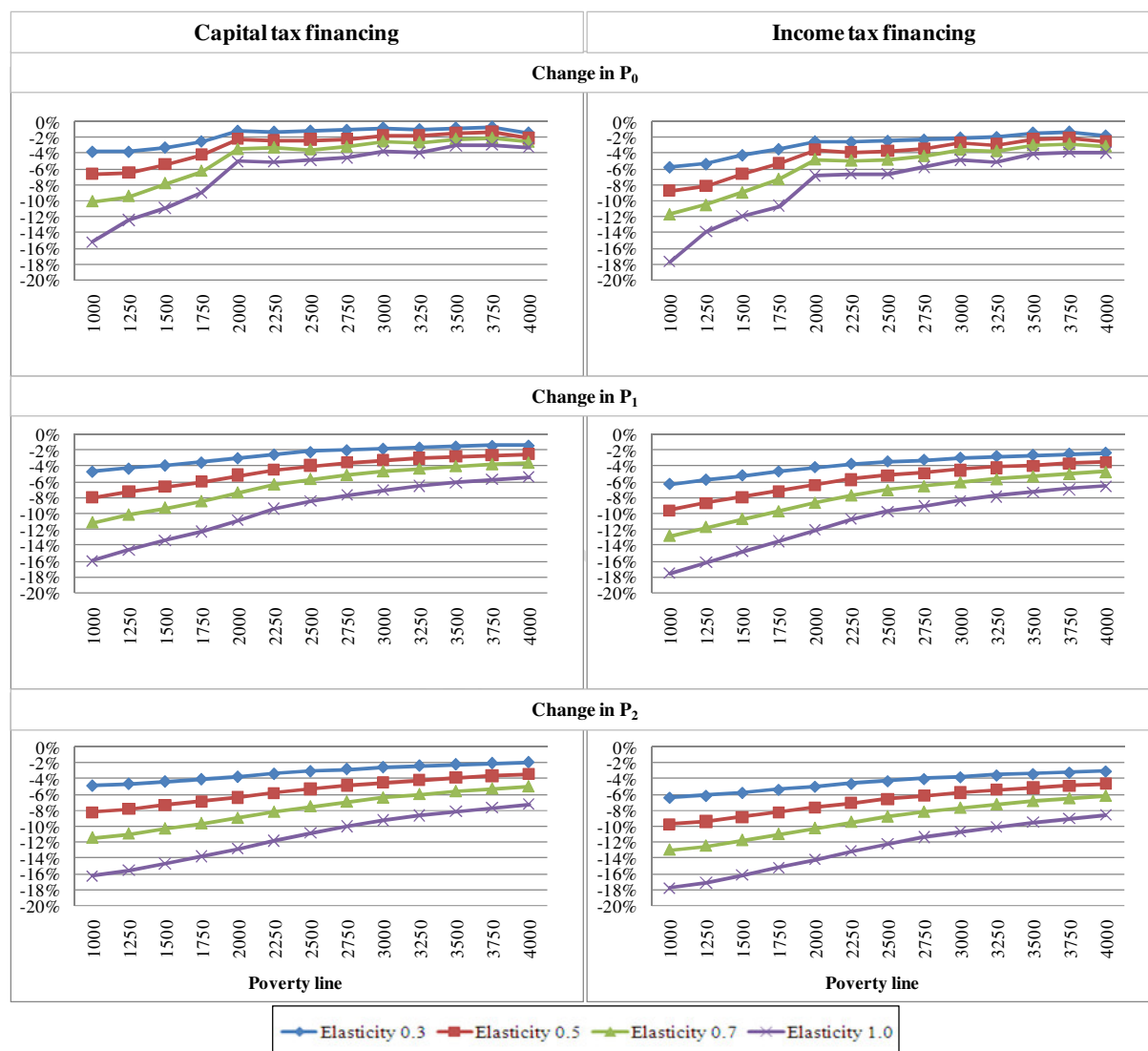
There are two ways in which a change in disposable income can be evaluated in the micro-incidence model. The one option is to simply link changes in disposable income at the household group level as observed in the CGE model directly with a measure of disposable income in the micro-incidence model. However, since the tax burden is unevenly distributed among individual households within the representative household groups, the preferred approach is therefore to still link changes in gross income from the CGE model with the micro-incidence model, but to also extract and apply changes in average tax rates from the CGE model as a second link between the macro- and micro-models. An income generation function is then created within the micro-incidence model which ensures that only those members of the representative household groups that pay taxes in the base increase their tax payments to finance the subsidy programme. This ensures that the tax incidence is non-neutral within households, which is more in line with reality.

Figure 6.1 shows the changes in the FGT poverty measures under the micro-incidence approach, where the welfare measure is now per capita disposable income (i.e. the per capita after-tax income).⁸⁵ Poverty changes are evaluated at notional poverty lines ranging from R1 000 to R4 000 per capita per annum. Only the results from the short run scenarios are presented. A first general observation is that poverty gains are greater under the income tax financing scenarios than under the capital tax scenarios, which relates to the fact that capital

⁸⁵ Appendix Table 10 shows the baseline poverty estimates against which the changes are measured.

taxes, in contrast to income taxes, erode income of households across the income spectrum. The income tax financing option mainly has an impact on disposable incomes at the top-end of the income distribution and not so much in the vicinity of the poverty lines considered here. Generally, gains in poverty are higher at the lower poverty lines. This is expected given that low-income households are implicitly targeted by the wage subsidy programme through targeting low-wage workers.

Figure 6.1: Changes in FGT Poverty Measures: Micro-Incidence Approach



Note: Results are from the short run scenarios.

Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

There are several reasons why a partial equilibrium model would not have been appropriate in this context. In short, a partial equilibrium model would generate biased employment and poverty results partly due to the fact that the impact of reduced production costs associated with a general wage subsidy programme, which in this model are passed on to consumers in the form of lower commodity prices, is not fully taken into account in a partial equilibrium

model. The implications of financing are also ignored in a partial equilibrium model framework. A partial equilibrium model was therefore not used to evaluate the wage subsidies.

b) Comparing Results from a Micro-Simulation Model

The setup of the wage subsidy micro-simulation model is very similar to the one developed for the minimum wage scenarios (see Chapter 4 for details). However, there are two important differences. The first concerns the allocation of job losses. In the minimum wage scenarios job losses were targeted at sub-minimum wage workers, while weighting factors were applied to unemployment probabilities in some scenarios. In the wage subsidy simulations no such weighting is applied, and job losses are simply allocated on the basis of a ranking of the standard unemployment probabilities that were estimated using the occupational choice model (see Appendix, section 2.2). Of course, low-skilled job losses rarely occur in a wage subsidy context. Only the short-run income tax financing results are considered in the micro-simulation model here, and as shown earlier in Table 6.4, low-skilled job losses only occurred in the first simulation ($\eta = 0.3$). These job losses are furthermore completely insignificant relative to the extent of the employment gains.

In the context of a wage subsidy scenario the allocation of job gains in the micro-simulation model is clearly of greater interest and importance. This brings us to the second important difference in the setup of the micro-simulation model. By construction, only broadly unemployed persons (including those that lose their jobs and become unemployed as a result of the policy shock) can compete for new jobs. Beneficiaries are selected on the basis of their predicted probabilities of being employed, as estimated from the multinomial occupational choice. Although no weighting is applied to predicted probabilities, two specific targeted scenarios are modelled. In both scenarios only Black (African, Coloured and Asian) unemployed persons qualify for new jobs.⁸⁶ The first scenario allows any Black jobseeker to become employed (this is referred to as the ‘non-targeted’ scenario) while in the second only jobseekers under the age of 35 can gain employment (the ‘youth-targeted’ scenario).

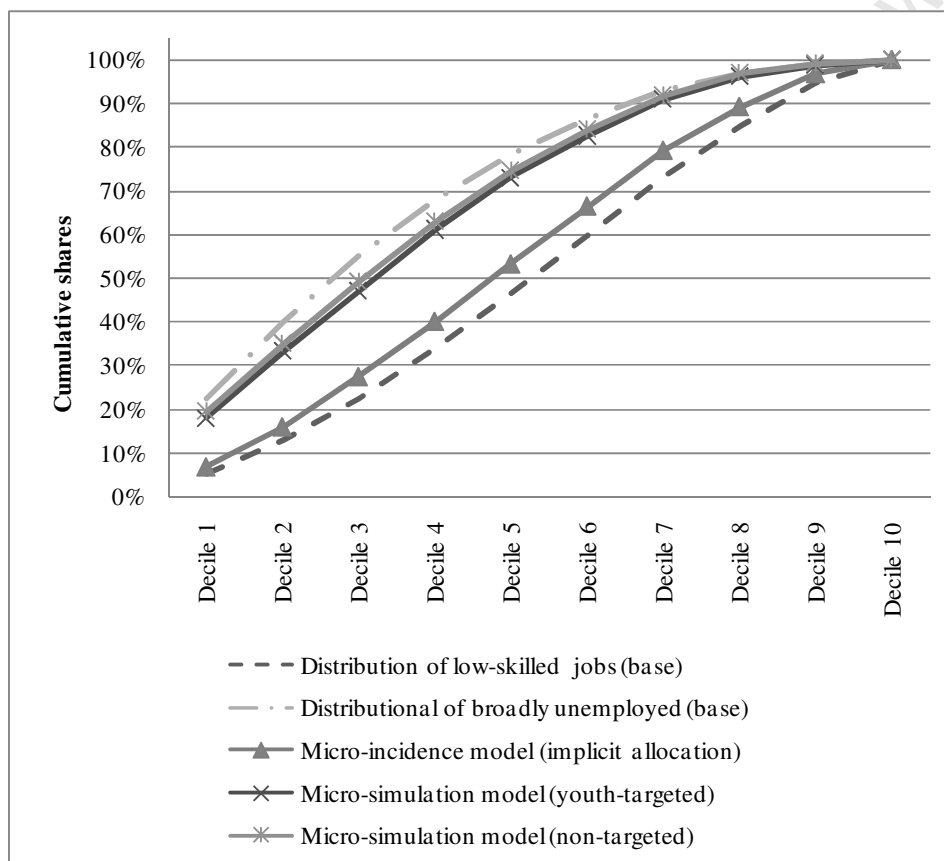
The micro-simulation and micro-incidence models therefore differ substantially in terms of the way in which job gains are allocated. Whereas the micro-incidence model follows the implicit allocation of job gains as per the CGE model (i.e., new jobs are allocated among households in roughly the same proportions in which low-skilled jobs are distributed in the base), the micro-simulation model allocates new jobs to unemployed persons, and particularly those that meet the criteria (Black or youth) and have the highest probabilities of

⁸⁶ Targeting only Black jobseekers ensures consistency with the implicit targeting of Black workers in the CGE model simulations. Incidentally, only about 2 per cent of unemployed persons are White (IES/LFS 2000), so if this layer of targeting was removed the results are unlikely to change much.

gaining employment. Since unemployed persons are distributed differently among household income groups than low-skilled workers, it is likely that these two approaches will yield very different job allocation distributions.

This is illustrated in Figure 6.2, which shows the cumulative distribution of job gains under the micro-incidence model (implicit allocation) and the micro-simulation model in the short-run income tax financing scenario for $\eta = 0.7$. The dashed line at the bottom shows the distribution of low-skilled jobs in the base model. Clearly the implicit allocation of new jobs in the micro-incidence model follows a very similar distribution. The dashed line at the top shows the distribution of unemployed persons (broad definition) in the base data. This distribution is comparable with the job allocations as predicted by two micro-simulation scenarios (youth-targeted and non-targeted).

Figure 6.2: Cumulative Job Gains under Alternative Micro-Modelling Approaches ($\eta = 0.7$)



Source: CGE/micro-model results

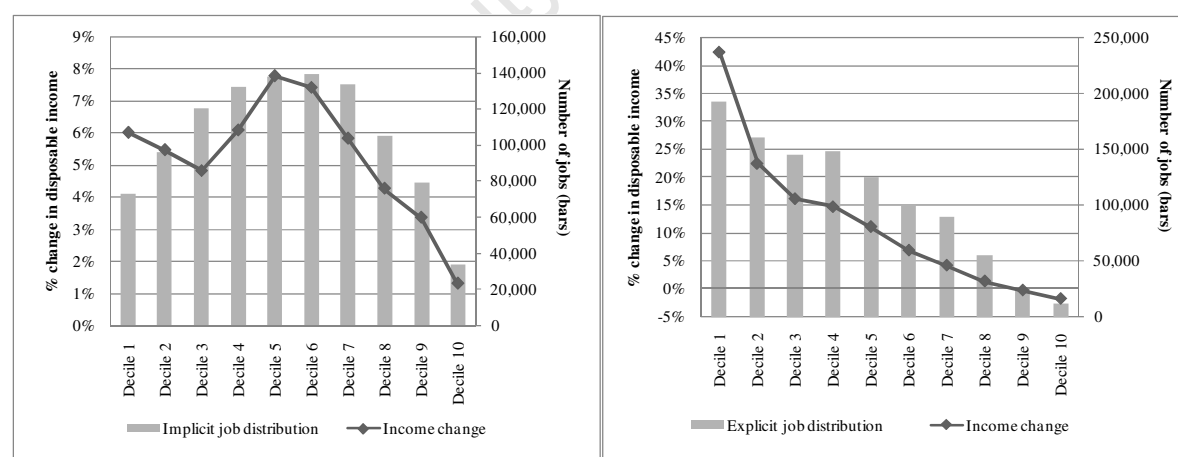
It is clear that results from the micro-simulation model will be more pro-poor than those generated in the micro-incidence model. As far as the two micro-simulation scenarios are concerned, it is interesting to note that the job allocations are very similar whether the youth are targeted or not. A seemingly obvious reason for this is that since the youth make up about 73 per cent of the broadly unemployed (according to the IES/LFS 2000), they are also more

likely to gain from new employment opportunities whether they are explicitly targeted by the policy or not.

This is, in fact, not entirely true. In the non-targeted scenario a disproportionate share of new employment opportunities (68 per cent) accrue to non-youth. For example, of the approximately 320 000 jobs created in the wholesale and retail trade sector ($\eta = 0.7$; see Table 6.4), only 86 000 or 27 per cent went to young people. This reflects the relative disadvantage of the youth in securing employment. The fact that the distributional patterns are so similar therefore simply reflects the fact that both the youth and non-youth unemployed are distributed very similarly across the income groups. A youth-targeted policy is therefore not superior from a distributional point of view, but it does afford the youth a chance of securing employment ahead of their older cohorts.

Differences in job allocation between the micro-incidence and micro-simulation models explain much of the difference in income distributions and poverty results generated by these two modelling approaches. Figure 6.3 shows the percentage changes in disposable income (by deciles) as generated by the micro-incidence (left) and micro-simulation (right) models. Also shown (bar graph; see right-hand axes) is the implicit or actual distribution of new jobs among household deciles, in this instance for $\eta = 0.7$. It is clear that job gains are biased in favour of the middle-income deciles when the micro-incidence approach is followed. As a result income gains are also generally higher in these deciles.

Figure 6.3: Changes in Disposable Income: Micro-Incidence and Micro-Simulation Models



Note: The bars show the distribution of job gains when $\eta = 0.7$.

Source: CGE/micro-model results

However, under the youth-targeted micro-simulation approach job gains are distributed more in favour of the poorer deciles, which results in very large increases in disposable income in these deciles. In fact, the average increase in disposable income in the bottom four deciles

(the poor) is 21 per cent when the wage elasticity is $\eta = 0.7$, compared to only 6 per cent in the micro-incidence model.

On the face of it this may seem like an error, but some simple checks reveal that these estimates are in fact accurate given the assumptions of the model. There are approximately 3 million employed people in the bottom four deciles in the base (IES/LFS 2000). This represents 28 per cent of total employment in the economy. The average annual wage (in 2000 prices) of these workers is only about R7 200. Wage income contributes about half of the aggregate income in these poor deciles (about R23.5 billion). In the youth-targeted simulation (for $\eta = 0.7$) about 420 000 new jobs are allocated to these poor household groups. This represents 61 per cent of all new jobs created. The average estimated wage for these newly appointed individuals (based on an earnings function) is R16 500, more than double the amount earned by other poor workers.⁸⁷ The total addition to income is about R10.6 billion, which is 23 per cent of the base income. Once taxes are taken into account, the 21 per cent increase in disposable income among the poor seems realistic.

We next turn to poverty effects. The poverty results generated depend on three aspects. It firstly depends on the assumption about the way in which jobs are allocated among poor and non-poor household groups. As we have seen the micro-simulation model allows for a much more favourable distribution for the poor. In any job gain scenario it is also necessary to make assumptions about how much a newly employed person might earn; hence, a second important issue is the estimation of this wage. In the CGE model (and by extension the micro-incidence model) new labour market entrants earn the same sector-specific average wage as other workers in the same factor group. In contrast, the micro-simulation model uses an econometrically estimated earnings function to predict wages based on personal characteristics of the beneficiaries of the policy.

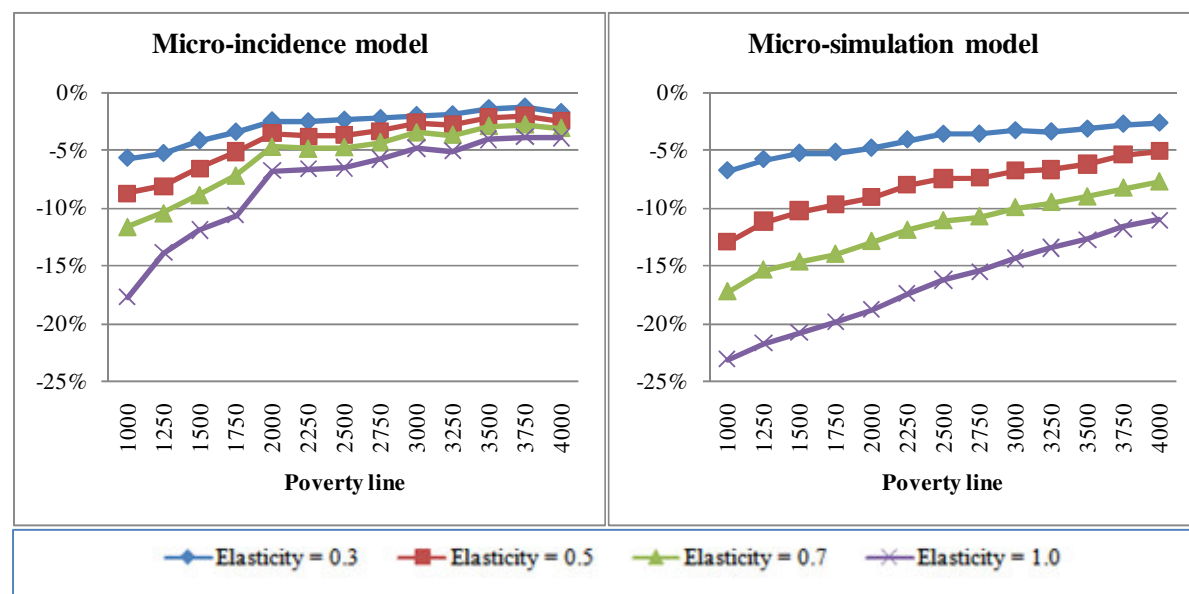
The third factor is the wage elasticity of demand. Even in this micro-simulation model that is set up to produce pro-poor results the gains are highly sensitive to the wage elasticity level. For example, if the elasticity is low ($\eta = 0.3$), income gains in the bottom four deciles will 'only' be 9 per cent, which is only about a third of the gain under the benchmark elasticity.

Figure 6.4 compares the poverty results obtained under the youth-targeted micro-simulation model with those from the micro-incidence model. At high wage elasticity levels the poverty-reducing effects are much larger under the micro-simulation model, which relates to the fact that under this scenario where many jobs are created, relatively more jobs are also allocated

⁸⁷ This implication of this is that those unemployed persons who gain in these simulations are probably poor because of their labour market status, but once they find employment their earnings greatly potential exceeds that of the existing working poor. The estimated wage here is still slightly below that of the average targeted workers, which is about R18 000 (see Appendix Figure 3).

to poor jobseekers through direct targeting. At low wage elasticity levels the two approaches yield similar poverty effects. Under both models the wage subsidy leads to large declines in the depth of poverty (P_1). These results are shown in Figure 6.5.

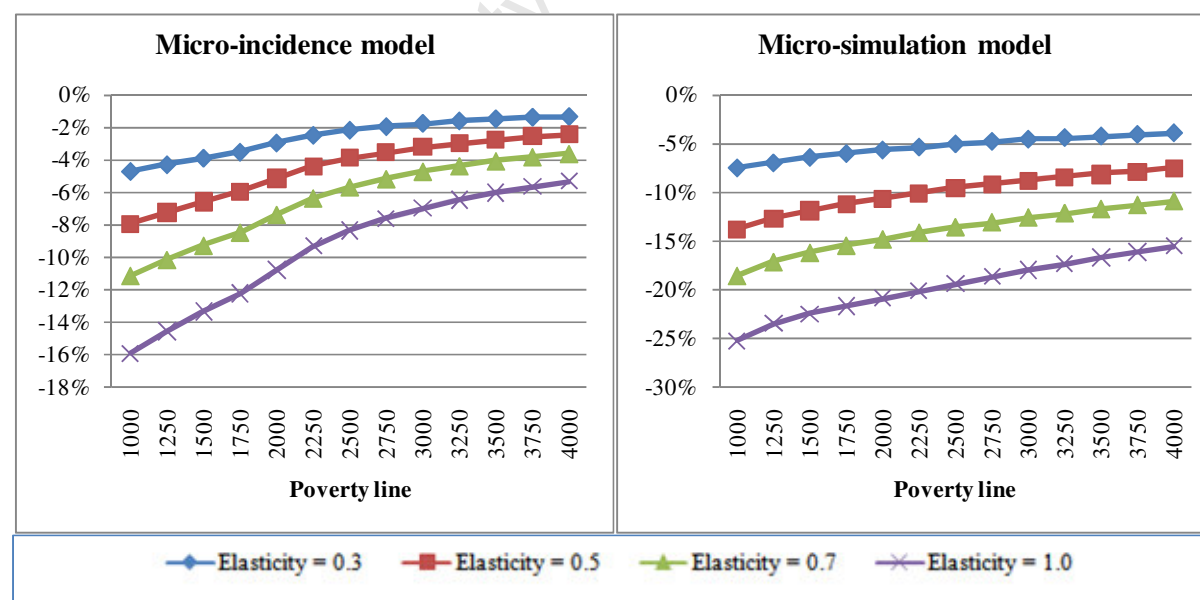
Figure 6.4: Changes in P_0 : Comparing Results under Different Modelling Approaches



Notes: Both sets of results are from the short run scenario with income tax financing. The micro-simulation results are from the youth-targeted scenario.

Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

Figure 6.5: Changes in P_1 : Comparing Results under Different Modelling Approaches



Notes: Both sets of results are from the short run scenario with income tax financing. The micro-simulation results are from the youth-targeted scenario.

Source: CGE/micro-model results, IES/LFS 2000 and author's own calculations.

Poverty results based on changes in gross income as opposed to after-tax income look very similar to those shown above. This reflects that fact that income taxes mostly affect households at the upper end of the income distribution, and not those in the vicinity of the poverty line. However, when estimating inequality changes, a disposable income measure is perhaps more meaningful. Table 6.10 shows the percentage changes in the Gini and Theil-L coefficients, and compares the outcomes under the micro-incidence and micro-simulation approaches. As expected, given larger increases in per capita incomes at the lower end of the distribution, the micro-simulation model produces much larger changes in inequality, especially when the wage elasticity is high.

Table 6.10: Inequality Results: Micro-Incidence and Micro-Simulation Models

Wage Elasticity	Change in Gini		Change in Theil-L	
	Micro-incidence	Micro-simulation	Micro-incidence	Micro-simulation
$\eta = 0.3$	-0.5%	-1.0%	-1.5%	-2.5%
$\eta = 0.5$	-0.7%	-1.6%	-1.9%	-4.0%
$\eta = 0.7$	-0.9%	-2.3%	-2.4%	-5.4%
$\eta = 1.0$	-1.1%	-3.4%	-3.0%	-7.7%

Source: CGE/micro-model results

At around the same time as these simulations were conducted, the South African National Treasury commissioned research into a wage subsidy scheme. The report is currently available as a Working Paper (see Go et al., 2009). Although the studies differ as far as the simulations and certain model features are concerned, a comparison of results is still appropriate. This is provided in section 4.2.3 of the Appendix.

3. Final Remarks

The results and analyses in this study contribute to a rapidly growing and recent South African literature on the effectiveness of wage subsidies in reducing unemployment and poverty in this country. As with the minimum wage simulations before, the importance of assumptions around the level of the wage elasticity is important in determining the poverty-reducing effects of wage subsidies. Some fairly significant gains materialise under a carefully designed targeted policy, but once again the model setup is important in explaining the results. The results here should be regarded as fairly optimistic given assumptions of perfectly competitive product markets and participation by all firms. More detailed conclusions are made in Chapter 7.

Chapter 7. Conclusions

Relentless poverty remains one of the greatest challenges facing the South African society today. The defining causes of poverty can be sought in the failures of the labour market to generate enough quality jobs that offer reasonable wages. This centrality of the labour market in the determination of poverty suggests that labour market policies – whether these are policies that generate jobs or raise incomes directly – will always be regarded as central in the fight against poverty. A proper understanding of the nature of the labour market and its role in the determination of poverty is of paramount importance if appropriate labour market policies are to be designed.

A review of the recent labour market and economic trends reveals that economic growth, although positive throughout the period 1995 to 2005, failed to generate enough employment opportunities to reduce unemployment. A particular concern is the slow growth in formal sector employment, with much of the employment growth occurring in the informal sector and among self-employed persons. The employment growth that did materialise during the last decade was furthermore overshadowed by a rapid increase in labour supply, with participation rates among Africans, women and the youth in particular rising rapidly. Despite the fact that many of these new labour market participants are better educated than incumbents, they lack work experience, which has been shown to be a great stumbling block towards finding employment. A general distrust in the education system has meant that employers are reluctant to employ young labour market entrants. This has given rise to a severe youth unemployment problem in South Africa.

The type of growth experienced during the last decade or more has also not been beneficial from a labour absorption perspective. Technical advancements in production processes as well as structural shifts in production away from low-skill intensive primary sectors towards high-skill- and capital-intensive manufacturing and services sectors have all contributed to the fact that high skilled workers are in high demand. This demand shift has been at the expense of low-skilled workers, thus giving rise to a so-called structural unemployment problem. This has been exacerbated by the rapid increase in low-skilled labour force participation rates. Many of the poor unemployed simply lack the skills and experience necessary to effectively compete for skilled vacancies that exist in the economy.

Rising costs of employment, driven in part by slow growth in productivity and increased labour market regulation, have further dampened demand for low-skilled workers. Indications are that employers perceive employing new, inexperienced labour market entrants to be more risky and ultimately more costly than not employing people at all. Part of this relates to the fact that new recruits often require substantial training, but once trained, such workers become susceptible to job-hopping given the general skills shortages in the economy.

The suggestion is that wage subsidies may be useful tools for addressing this problem of a deficient demand for low-skilled workers. By subsidising wages of low-skilled workers they become a more attractive proposition from an employer's perspective. If such a policy is successful in reducing unemployment, and particularly unemployment among the poor, it may have important poverty-reducing effects. Although wage subsidies potentially involve a significant cost to government, the positive social and economic externalities associated with lower unemployment and increased absorption of workers into the formal sector are offered as a justification for this expense.

A lack of skills and experience, low levels of education and poor quality education are some of the key explanatory factors for high levels of economic inactivity and unemployment among the poor. These same characteristics explain why those among the poor that are fortunate enough to find employment generally earn very low wages. While employers perhaps perceive the cost of employment of low-skilled workers as too high relative to those of skilled workers, wages earned by low-skilled workers are certainly low from an employee's perspective. Low-wage workers are often the sole income earners in large families; thus, attachment to an employment opportunity is no guarantee against poverty. It is for this reason that minimum wages could also be considered appropriate and a potentially effective policy tool in the fight against poverty.

Minimum wages may be effective at reaching large numbers of poor people given the large and growing number of people that are attached directly or indirectly (via family structures) to the labour market. It is also a policy that is fairly easily implementable in that it requires little direct government involvement other than monitoring employers for compliance. In addition to the potential poverty effects, minimum wages are further justified on the basis that workers deserve a fair wage. The possibility that minimum wages might lead to job losses is downplayed by its proponents, with discourse on this policy measure rather focusing on the fact that minimum wages are important in the fight against labour market exploitation and poverty among workers and their families.

There are several economic and socio-economic reasons why a labour market approach to poverty reduction is more sensible than, say, a 'direct' approach such as an expansion of the welfare system. Policies that bring people into employment (wage subsidies) or that reward

those that are employed (minimum wages) ensure that people contribute to production and add value in the economy. As such, labour market policies are more sustainable in the long run than welfare policies. On the socio-economic front, a reduction in unemployment and/or improved conditions of employment will boost morale and reduce the sense of uselessness and idleness among the unemployed or under-employed. Being in employment as opposed to being idle improves people's skills levels. This in turn raises their future productivity levels, earnings potential and employment prospects.

However, using labour market-based policies to combat poverty is also challenging. With respect to minimum wages, evidence presented in this study suggests that wages of the working poor would have to increase substantially before they are likely to have a meaningful effect on overall poverty. Poor households that are attached to the labour market via an employed household member are often large, which implies that wage income gains are shared among many. Many poor households, and especially the very poor, are in fact completely detached from the labour market and rely instead on welfare and other transfers as a source of income. The effectiveness of minimum wage strategies in reaching the truly indigent is therefore limited. Non-compliance from employers may further limit the effectiveness of minimum wages in reducing poverty.

As far as job creation strategies such as wage subsidies are concerned, the poverty effects are dependent on how well such a programme is targeted at poor unemployed persons. Many of the poor unemployed live in spatially isolated communities far from economic centres where the jobs are, while they also often lack the skills necessary to be considered for the kind of vacancies that exist in the South African economy. Those among the unemployed that are financially better off are more likely to have had access to better education, while their social standing and networks allow them to search for work more effectively. From this perspective it is important that job creation efforts effectively target those that are most in need of support. Complementary measures that improve poor jobseekers employability or their capacity to search for jobs may also be required.

Both minimum wages and wage subsidies can be described as wage-based policies in the sense that a change in the wage-employment relationship is the primary policy lever. Minimum wage policies raise wages of workers directly, but since the costs are incurred by the employer, this may come at the expense of job losses. Under a firm-side wage subsidy policy and an infinitely elastic labour supply curve, workers' take-home wages are kept constant, but the wage paid by the firm is subsidised, the intention being that the subsidy would lead to increased employment and ultimately a decline in poverty.

The extent of the employment effects will be instrumental in determining the poverty effects of both these policies, and in this regard the wage elasticity of demand is of critical

importance. What makes the overall poverty impact highly uncertain is the lack of concrete evidence about the exact extent of the trade-off between wages and employment. Estimates of wage elasticities are sensitive to the source and level of aggregation of data, the time period over which the wage-employment relationship is analysed and the statistical estimation methods used. Standard wage elasticities further measure the employment response at the average wage. This may be different from the response at lower or higher wage levels. Adding to the uncertainty around the poverty effects of wage changes are questions around how the associated employment and/or wage income gains and losses might be distributed among individuals or households.

Indirect effects related to price and demand effects and the financing of policies may also play an important role. The existence of such indirect effects – and these were shown to be very significant – was a key factor in motivating the use of a general equilibrium modelling approach as opposed to a partial equilibrium approach.

Given the complexity of the policy outcomes, an ex ante modelling framework that allows for the exploration of various policy scenarios and one that captures various direct and indirect linkages will add much value in the debates around whether the policy proposals are appropriate and how they should be designed. Two main types of ex ante modelling approaches are considered in this study, namely partial and general equilibrium models. Partial equilibrium models are typically specified at a micro-level and can be non-behavioural (micro-incidence) or behavioural (micro-simulation) models. These models are useful for poverty and distributional analyses because they consider welfare changes at the individual unit of observations (i.e., individuals or households). However, they have limitations as far as the capturing of indirect effects is concerned. In particular, when simulating the impact of wage-based labour market policies, the important indirect price, demand, employment and (possibly) financing effects of such policies are ignored in such modelling frameworks.

General equilibrium models are effective at capturing these indirect effects, but the use of representative household and factor groups (as opposed to individual or real units of observation) in these models limits the precision of the model in estimating the micro-level effects. An underlying implication of CGE models is that income gains or losses accruing to a certain representative group are shared equally among all the individual members of that group. Furthermore, since linkages between factor markets and households are only captured at a group-level, and given a lack of information that would allow us to somehow ‘endogenise’ the functional relationship between households and factors, factor income gains or losses are distributed among household groups in fixed proportions (i.e., those proportions determined in the base data).

By extension, any employment gains or losses are implicitly distributed following the factor endowments in the base, which stands in contrast to the much more nuanced approaches that are permitted in some types of micro-models or even partial equilibrium models. This is particularly problematic when, for example, in a minimum wage context there is reason to believe that job losses will be concentrated among those workers that are further away from the minimum wage level prior to the policy implementation. Wage subsidy programmes, in turn, are targeted at the unemployed (or at specific sub-groups among the unemployed), and hence the distribution of job gains is more likely to follow the base-level distribution of the unemployed rather than that of the employed. A CGE model therefore produces results that may at times produce distributional results that are counterintuitive. These ‘biases’ can be either pro-poor or not, depending on the scenarios modelled.

As a result, we argue in this study, poverty and distributional effects of wage-based policies are best analysed in an integrated or sequential macro-micro modelling framework. Such a framework allows us to exploit the advantages of both model types. Various simulation results are generated using a CGE model and two types of micro-models, namely micro-incidence and micro-simulation model. The CGE and micro-models are linked sequentially. Whereas the CGE component is useful for evaluating aggregate production, employment and income effects, the micro-models are used to generate poverty and distributional results that are, as far as possible, consistent with the macro-model.

The simpler micro-incidence model links average disposable income changes observed at the household group level in the CGE model with individual members of those households in the survey-based micro-model. Such linking ensures that it is possible to differentiate between individual households within a household group, i.e., also those that are below or above a given poverty line. Hence, the poverty implications for individual households can be analysed more precisely than what is permitted within a CGE model alone.

However, the micro-incidence approach still suffers from many of the limitations of the representative household group approach to CGE modelling. Most importantly, job losses and gains are still implicitly allocated among household groups following the factor endowments in the base. This ultimately implies that income gains and losses associated with wage-based labour market policies cancel each other out at the household group level, thus causing poverty results to be averaged out or muted. Although this problem is diminished in models with highly disaggregated factor and household accounts (such as the model used here), the impact of such averaging out remains clear to see when comparing results with those generated in a micro-simulation model.

A micro-simulation model allows for a more nuanced approach whereby individual characteristics are taken into account when allocating job gains and losses. Essentially, this

implies that the main interface between the macro- and micro-models is at the level of the factor market, and hence a household income generation function is specified independently from the household income generation function in the CGE model. This necessarily means that the household income vector generated in the micro-model is no longer consistent with that of the CGE model. These inconsistency problems can, in theory, be overcome by setting up a macro-micro iterative model (i.e. a model with feedback from the micro- to the macro model). This has been identified by many as an important area of future research. Such models, however, are technically complex and often unstable, and hence their ease-of-use and functionality are presently still very limited.

The minimum wage simulations were designed specifically with the aim of exploring whether South Africa's existing minimum wages would have had any significant impact on poverty when they were introduced between 2002 and 2005. The focus is on those sectors that fall outside the sphere of Bargaining Councils and for which sectoral determinations have been instituted. An *ex ante* analysis of the effects of a policy that has already been in place for a number of years still adds value relative to an *ex post* evaluation since it permits an assessment of the outcomes in a 'controlled environment' free of external influences. The results are therefore useful for gauging the effectiveness of such policies in general and hence may influence future policy decisions around the expansion of minimum wage policies either through increasing existing minimum wage levels or instituting additional sectoral determinations. The model framework can also be used to explore any specific policy design options of such future policies, should the need arise.

Minimum wages are often justified on the basis of their poverty-reducing effects. The argument is that by targeting low-wage sectors or the working poor, minimum wages present an effective way of transferring money to poor households without requiring any major financial commitment or administrative involvement by government. As with any economic policy shock, however, minimum wage policies will have winners and losers. The winners are those that benefit from higher wages, but these gains come at the expense of job losses in the economy, especially among those workers with occupations and/or sectors of employment that are directly targeted by the policy. The extent of the job losses depends on the wage elasticity of demand, and hence this parameter is important in determining the overall poverty impact. Various other indirect effects may also play a role. The poverty effects are therefore uncertain and warrant further investigation.

Industry-level production and employment effects and changes in aggregate household incomes were explored with the help of a CGE model. A key result from the CGE model is a loss of about half a million low-skilled jobs at the benchmark national average wage elasticity of $\eta = 0.7$. A simplistic interpretation of this result is that, in the absence of minimum wages,

the broad unemployment rate would have been about 1.6 percentage points lower than the current observed rate of 37.3 per cent (2006). Under a long run scenario where sector-level structural changes are permitted, those sectors for which minimum wage levels are set contract further as capital stock levels decline. In turn, production capacities increase in non-minimum wage sectors under the long run closure as these sectors attract investments. However, the net effect is that employment losses in the long run are approximately 10 per cent higher than in the short run ($\eta = 0.7$) given the lower labour intensity in the expanding sectors compared to the declining minimum wage sectors.

The employment effects can be decomposed into components relating to substitution and scale effects. The latter relates to supply responses to changes in aggregate demand. A substitution effect is observed when minimum wages for low-skilled workers lead to an increase in demand for skilled workers. Yet, the CGE results show an overall decline in skilled wages. Given the labour market closure for skilled workers, this result indicates an overall decline in demand for skilled workers. The negative scale effects actually dominate the positive substitution effects for this labour group, thus serving as an indication of a general contraction in the economy as a result of the minimum wage policy.

Since CGE models are demand-driven, output levels are determined by consumer demand levels. Minimum wages cause production costs to rise, and hence commodity prices increase. This is especially true when the labour market substitution possibilities are limited. The result is that aggregate consumption demand declines due to minimum wages, which explains the overall decline in demand for all types of factors of production. This is an important result. In partial equilibrium models a wage elasticity of less than one will always lead to an increase in the aggregate wage bill, and hence scale effects are thought to be positive. However, in a general equilibrium model that accounts for the impact of prices, these indirect demand effects are negative at all wage elasticity levels. This result illustrates the advantage of using a general equilibrium framework for these types of analyses.

Despite the decline in employment among low-skilled workers, minimum wages still represent an effective way of redistributing factor income from skilled to low-skilled workers. This suggests that the higher wages earned by minimum wage workers more than offset the wage income losses associated with higher unemployment. This is not an unexpected result given inelastic labour demand, but even in this general equilibrium context that accounts for indirect effects, the result still holds for higher wage elasticity values. Low-skilled workers are typically attached to relatively poorer households and skilled workers are more likely to be linked to wealthier households. This implies that minimum wages may ultimately play an important role in redistributing household income from non-poor to poor households. In fact, as shown, the greatest beneficiaries are households in the bottom third of

the income distribution. These households experience an increase of around 2 to 3 per cent in their aggregate income, depending on the simulation, while those in the top third of the income distribution experience a decline in income of an equivalent magnitude as the increase in the bottom third.

While redistribution of income is an important policy goal in South Africa, the question is always at what cost is such redistribution achieved? In these particular simulations the opportunity costs of increased equality are reflected in a fairly large decline in employment, coupled with a net welfare loss in the economy. Total factor and household incomes decline by around one per cent in the benchmark simulation. This, however, does not imply that minimum wage policies should be abandoned. If minimum wages act as an incentive for workers to raise their productivity levels, the policy may even raise overall welfare levels while also mitigating some of the employment losses. In fact, results show that if the beneficiaries of minimum wage policies raise their productivity levels by as little as half of the percentage by which wages increase, the net welfare change (as measured by the change in aggregate household disposable income in the economy) becomes positive.

Of real interest in the minimum wage scenarios are the poverty effects under different modelling assumptions. The micro-level analyses focused on the short-run results in the absence of labour productivity adjustments. Several approaches were followed. A partial equilibrium framework was shown to overestimate the poverty-reducing effects of minimum wages, especially at low elasticity levels. This is due to the fact that such a model underestimates job losses in a low wage elasticity scenario because production cost effects of minimum wages are ignored. Partial equilibrium analyses therefore do not add enough to the debate, but they illustrate the advantage of having a model framework that links workers and households at the individual unit of observation.

A sequential macro-micro framework is more suited to the analysis. Two micro-modelling approaches were followed, namely a micro-incidence model and a micro-simulation model. These models are shown to produce very different poverty results, which makes it hard to make generalised conclusions. Although a micro-incidence model is easy to use and always produces results that are entirely consistent with the macro-model, the poverty effects are often muted due to averaging out of income gains and losses within representative household groups. For this reason a micro-simulation model is more appealing despite the macro-micro inconsistency problems that remain unresolved when feedback effects from the micro- to the macro-level are not modelled. Also, in this particular application to minimum wages, it was argued that the overall poverty results in the micro-simulation model are overstated relative to the CGE results due to the way in which wages of sub-minimum wage workers are

adjusted directly in the micro-model as opposed to the more orthodox micro-simulation method of linking wage changes as observed in the CGE model.

As far as the results are concerned, a first important point relates to the relationship between wage elasticities and the likely poverty effects. Higher wage elasticities are associated with greater employment losses among minimum wage workers, while at lower wage elasticities prices increase by more due to the effect minimum wages have on production costs in an inflexible labour market. Both employment losses and inflationary effects tend to erode the income gains associated with minimum wages, but in general the policy seems more effective in reducing poverty when the wage elasticity is low.

This relates to the fact that minimum wage-induced job losses are largely concentrated among low-wage workers that are more likely to be poor. Thus, when the wage elasticity is high, more poor people lose their jobs, and hence the poverty-reducing effects are diminished or poverty actually increases, depending on the model setup and assumptions. The income-eroding effects of price increases are felt by consumers across the entire income spectrum. Thus, when the wage elasticity is low, price increases serve as the primary financing mechanism for minimum wages, but this burden is shared more equally by consumers across the welfare spectrum.

A second important consideration is the issue of the distribution of job losses among individuals. Under the assumption that job losses disproportionately affect those further away from the minimum wage, poverty rates increase substantially at lower poverty lines. The implication is that minimum wages may well end up benefiting the relatively better off among the minimum wage workers, while workers who are already living in abject poverty may lose out further.

Finally, the results suggest that the poverty effects of minimum wages in South Africa are generally small. For example, at poverty lines between R2 000 and R4 000 the micro-incidence model suggest almost no decline in poverty or even small increases at high wage elasticities. The micro-simulation model, in turn, suggests a decline in the poverty headcount rate of between 2.5 (high elasticity) and 3.6 (low elasticity) per cent at a poverty line of R4 000. The latter is equivalent to the headcount rate dropping from 51.3 per cent in the base to 49.4 per cent – a decline of 1.9 percentage points or 800 000 people.

In Chapter 5 the example of a poor households with a single wage income earner was used to illustrate how a minimum wage in the region of R1 000 per month (or R12 000 per annum), once shared among six household members, will only be sufficient to lift that household beyond an ultra poverty line in the region of R2 000 per annum. The implication is that minimum wages in South Africa are perhaps not designed to have a meaningful impact on

poverty at conventional poverty lines in the region of R3 000 to R4 000. When taking household income sharing into account it should be clear from this example that minimum wage levels would have to be almost double the current level in order to have an impact on poverty at these higher poverty lines.

This raises the question of whether higher minimum wages a sensible approach to improving the poverty outcomes. The answer to this is probably 'no'. At the current moderate minimum wage levels firms may choose to absorb the cost increases or pass them on to consumers without adjusting employment levels. The employment response may therefore be even smaller than what is observed at the benchmark wage elasticity level used in this analysis. If, however, the wage increase is high relative to the average wage in a sector, the employment response may well be higher than what we expect it to be.

South African minimum wages, when first introduced, were set roughly at the median wage level in covered sectors. It is unclear exactly what the true employment response has been given a fairly strong employment performance in the economy between 2001 and 2006 when most of the sectoral determinations were introduced. However, since being implemented, annual minimum wage adjustments have been moderate, with the inflation rate used as the guideline in this respect. It is probably reasonable to assume that employment responses to such year-on-year adjustments have been minimal.

In its current format minimum wages appear to be successful in redistributing some income from wealthier to poorer households, albeit at the cost of an overall decline in household welfare. However, attempts at using minimum wages to lower poverty should be resisted. Minimum wages that are set too high run the risk of leading to much larger employment losses, an outcome that is certainly undesirable in a country riddled with high unemployment. As such, minimum wages should remain a moral guideline to employers rather than a policy tool that hopes to reduce poverty among low-wage workers and their families.

Wage subsidy programmes are once again high on the policy agenda after the recent proposal from the Harvard Group. There are many reasons to believe that a wage subsidy may be appropriate for South Africa. Any policy measure that reduces unemployment is important from both a socio-economic and economic perspective. Lower unemployment will lead to a decline in poverty, while policies that allow people to enter employment where they acquire skills and add value to the economy make sound economic sense.

Wage subsidies targeted at low-skilled workers will improve the relative attractiveness of these workers. Despite a surplus of low-skilled labour, the South African economy is becoming increasingly skills- and capital-intensive. This points at an imbalance in relative employment costs of low-skilled versus skilled workers, and hence a policy that corrects this

imbalance is appropriate. Wage subsidies will further reduce the perceived risk of hiring young, inexperienced labour market participants, a group that is also most prone to being unemployed.

While a wage subsidy programme sounds good in principle, similar programmes elsewhere have been not been as successful as expected. Thus, the most contentious issue in the wage subsidy debate is whether these programmes actually generate more jobs than what would have been created in the absence of the policy. Put differently, are firms simply collecting the subsidy as a windfall gain without generating above-equilibrium employment? Job creation should, after all, be the single most important policy goal of wage subsidy programmes, especially when implemented in a labour surplus economy such as South Africa as a measure to reduce unemployment.

The review of the international evidence further suggests that many of the beneficiaries of wage subsidy schemes are those that would have found employment in the absence of the subsidy anyway. This may especially be true when wage subsidies are widely targeted, which allows firms to cherry-pick their preferred candidates. Those jobseekers that are truly in need of support simply do not make it to the front of the job queue. The design of the wage subsidy scheme is clearly important, as an appropriately designed policy will avoid such unintended consequences.

Before considering the model results, it is useful to briefly look at some of the design options and to consider which are most appropriate in the South African context. In economies with labour supply constraints, worker-side subsidies are appropriate and have also been quite successful. It should be clear, though, that a firm-side subsidy is more appropriate in South Africa given the context of surplus low-skilled labour in this economy. The aim, after all, should be to raise demand for those workers that are in excess supply as opposed to raising labour supply.

There are also several targeting considerations. Although targeting reduces the overall subsidy cost, which may be necessary depending on the budget that is available for such a programme, targeting should also be based on sound economic principles. Unemployment is a highly complex phenomenon in South Africa, with elements of a structural problem, deficient demand due to employment cost imbalances and low levels of economic activity, as well as labour supply-side problems. Wage subsidies are not appropriate to address all these types of unemployment, and should therefore not be seen as a blanket solution to unemployment. It is therefore important to identify those subsets of unemployed persons that would in fact benefit from a wage subsidy programme, and to then actively target these individuals.

In South Africa the idea of a youth-targeted wage subsidy that ties in with a broader suite of labour market policies aimed at improving skills and labour market absorption among the youth is appropriate. Earlier analyses have shown that the youth are particularly disadvantaged as far as employment prospects are concerned. This group of labour market participants often lack work experience and require substantial training by firms. Given the weak signals that firms are getting from the South African education system, firms perceive employing young people as being risky. A wage subsidy reduces that risk that firms face, thus serving as an incentive for them to employ more of these workers.

It is important, though, that firm-side wage subsidies are generous enough to ensure participation by firms. In addition to being an incentive to employ workers that may be perceived as being risky, the subsidy should also cover the administrative costs incurred under such a programme. It is unclear exactly what level of subsidisation would be deemed sufficient, and unfortunately economic models cannot predict this threshold level at which firms may decide to start participating. Consultation with stakeholders or a trial-and-error approach to policy design may therefore be necessary.

A final design issue that deserves some consideration is that of training-linked subsidies. Many have argued that training-linked wage subsidy programmes have merit when unemployment is linked to a skills deficit as is the case in South Africa. Training-linked wage subsidy programmes may also seem particularly relevant in the context of the youth-targeted programmes, given that many of the youth are considered inexperienced and do in fact require substantial training upon being employed. Experiences with training-linked wage subsidies elsewhere seem positive, but it is clear from the survey of the literature that more analysis is needed. In South Africa the learnership programme does not appear to have had a significant impact on employment levels, and hence it is important to consider whether a new wage subsidy programme in this country should be linked to training. Two points can be made in this regard.

Firstly, the country already has a learnership programme with a strong training focus in place. Many of the problems with this programme seem to be associated with poor implementation and management by the sectoral authorities. While much can be learned from this programme with regards to administration and implementation of wage subsidy programmes in general, the idea of designing and implementing a new programme with similar objectives to the learnership scheme seems redundant. The aim should rather be to improve and strengthen the learnership programme as far as its administration is concerned (an area found to be seriously lacking), while at the same time narrowing its focus to training and education exclusively, rather than seeing it as a policy that has the potential to address both the skills shortage and unemployment at the same time.

The second issue relates to training that takes place in firms. Firms tend to want to train people that they choose to employ, as this makes sense from a business perspective. The operative word here is the 'choice' or decision about whether to employ people or not. There appears to be a general reluctance among firms in taking the first step and offering people jobs, given the risk factors referred to earlier. The real bottleneck is therefore getting people into employment, and not getting people into training programmes. A wage subsidy programme, therefore, should be a stand-alone employment promotion programme. This policy need not replace the learnership scheme, as some firms may still wish to offer their training under the auspices of that scheme.

In an attempt to add value to the analysis and to help answer some of the policy questions that may arise, several wage subsidy simulations were implemented in a CGE framework. Key features of the hypothetical policy simulated include: (1) a broadly targeted wage subsidy equal to 50 per cent of the annual wage and capped at R4 200 per annum (2000 prices); (2) targeting of low-skilled occupation groups with an average annual wage of less than R35 000 (2000 prices); (3) targeting of agricultural, light manufacturing and non-government services (excluding private households); (4) an overall programme budget in line with those estimated by National Treasury (R25 to R30 billion per annum in 2007 prices); (5) modelled as a general as opposed to a marginal subsidy; and (6) financed through increased household income taxes or through the introduction of a tax on capital stock employed in targeted sectors.

The CGE model results suggest that fairly large employment gains may materialise under this hypothetical policy setup. Simulated employment gains range from about 500 000 to over one million low-skilled jobs for elasticity values ranging between $\eta = 0.3$ and $\eta = 0.7$. Of course, these job gains are directly dependent on the size of the subsidy, and R30 billion is a considerable amount when compared against the total welfare budget of R90 billion in 2000. Importantly, however, employment gains increase significantly at higher wage elasticity levels.

The fact that the programme is modelled as a general wage subsidy has important implications for the cost-effectiveness of the subsidy. The cost-per-job falls by about 50 per cent to R20 000 when the wage elasticity increases from $\eta = 0.3$ to $\eta = 0.7$. This amount still exceeds the average wage of targeted workers (about R18 000), which may lead some to conclude that a general wage subsidy programme is cost inefficient.

The reality is that such a general subsidy acts as both a wage subsidy and a production subsidy (the subsidisation of existing workers under this policy is effectively a production subsidy). In a perfectly competitive CGE model any production cost reductions are passed on to consumers in the form of lower commodity prices. Important welfare effects arise from

this. The policy should therefore not only be judged on the basis of its employment effect and the cost-per-job estimate, but rather on its overall welfare or poverty effects.

Perfect pass-through of prices is of course a strong assumption. Firms with some market power may have a strong incentive to capture the wage subsidy as rent. Prices may therefore not decline as much as predicted in a CGE model. The implications of imperfectly competitive product markets and mark-up pricing for the effectiveness of a wage subsidy scheme are important issues for future research. The important question is what firms do with these increased profits earned when prices are not decreased. One possibility is for firms to increase their production capacity levels in the long run by investing more in capital stock (an accumulation effect). Alternatively, the shareholders of firms may benefit from increased profits, in which case the beneficiaries are more likely to be relatively wealthy households.

In the same manner the existence of strong union power may mean that part of the wage subsidy is captured as a wage increase. In the extreme case the entire subsidy is captured by workers and no employment effect is observed. Only targeted incumbents gain from higher wages, funded in this instance by government.

There is one further reason why the employment responses observed at the benchmark simulation ($\eta = 0.7$) might be considered optimistic. Even though the benchmark wage elasticity level used here is consistent with econometric estimates, this measure reflects observed employment responses in a 'business as usual' context. International evidence, and also the evidence from the South African learnership scheme, suggest that high administrative costs and procedurally complex processes associated with these types of schemes may seriously hamper firm participation and hence also the effectiveness of the programme. The simulations do not take into account such hidden costs or barriers to participation. Administrative costs incurred by government itself are also not accounted for. As such the employment results in the benchmark simulation represent the 'best case scenario' or an upper bound of the kind of employment responses that will materialise under a wage subsidy scheme in South Africa.

While low participation rates among firms do not really relate to the wage elasticity, a low elasticity level could be seen as a proxy of low participation. Given this, it can be argued that a lower wage elasticity level may be a more realistic benchmark level. For a wage elasticity of $\eta = 0.3$ (for example), the cost per job created (R40 000) becomes excessive and serious consideration needs to be given to whether a general subsidy can be justified at such a low effective wage elasticity level.

A less costly marginal wage subsidy programme may thus be required. Under a marginal subsidy the average cost per job will always remain equal to the average subsidy value paid

for every additional worker. Given the simulation setup here, this will amount to about 12.5 per cent of the average low-skilled wage or about R2 250. This frees up a substantial amount of funding to either increase the subsidy value per worker or to extend the coverage of the programme.

A standard firm-side marginal wage subsidy programme may be particularly difficult to administer. The monitoring and evaluation processes associated with such a marginal wage subsidy will also be considerably more complex than a simple general subsidy programme. These direct and implicit costs incurred by government and firms alike will reduce participation by firms, thus causing the employment generation potential of such a scheme to be diminished. The indirect employment effects of a marginal subsidy scheme are also likely to be smaller than that of a general subsidy, while it may create an incentive for firms to replace existing workers with subsidised ones in order to maximise their benefits.

A worker-initiated subsidy, which is effectively a variation on the standard firm-side marginal subsidy, is certainly the preferred design option for a marginal subsidy programme in South Africa. In terms of the Harvard Group's proposed design for such a programme in, only matriculants (who represent new labour market entrants) will receive a voucher that employers can draw funds from. As an added advantage, such worker-initiated subsidies have been shown to improve the supply-side job search incentives, while the administrative burden is also shifted away from the firm towards government or the implementation agency.

Of course, as with standard marginal subsidies, even this scheme may result in the displacement of incumbents by subsidised youth. Even so, it is still likely that the programme would lead to positive overall scale effects, which means that demand for unsubsidised workers may also increase (see below). A further danger exists in that voucher-carrying workers may be stigmatized, but this may be less of an issue when the programme is widely targeted. Broad-level targeting, of course, is once again associated with the risk that many of the beneficiaries might be those that would have found employment even in the absence of the subsidy. This issue is clearly a recurring theme in the debate.

The CGE analysis has shown that overall factor incomes of low-skilled workers rise as a result of higher employment generated under the auspices of the wage subsidy programme. This is not unexpected. A further heartening result is that there is no real evidence of unintended substitution of skilled workers for low-skilled workers, with overall demand for both these types of workers increasing as a result of wage subsidies. This suggests that despite the increased burden placed on the shoulders of taxpayers or owners of capital stock under the two financing options, the aggregate output and employment effects associated with a wage subsidy scheme are positive.

As far as financing is concerned, the findings suggest that a capital tax, although yielding better employment results than the income tax option in the short run, harms the long run production and employment capacity in the wage subsidy sectors (i.e. the sectors in which the tax is introduced). In the long run, therefore the income tax option is a preferable method of raising revenue for the programme. From a purely distributional point of view the income tax option also produces more satisfying results. This relates to the fact that the income tax increases required to finance the subsidy programme largely affect households at the top-end of the income distribution. In contrast, the burden of capital taxes seems to be more equally distributed among households across the income spectrum, which relates to the fact that returns to capital is an important income source to all households, irrespective of their level of welfare. As discussed, though, the fact that data limitations prevent us from distinguishing between human and physical capital stock detracts from the strength of this conclusion. In reality a capital tax would be levied against physical capital stock employed in formal sectors, the returns of which are probably more likely to accrue to wealthier households than to poorer households.

The central focus of the wage subsidy simulations is on the poverty effects of this policy instrument. Once again, two modelling approaches were adopted. The micro-incidence model shows that all measures of poverty decline and at all poverty lines. The gains in poverty are also more pronounced at higher elasticity levels. However, this approach is somewhat problematic in that job gains associated with the policy are implicitly distributed across households groups in the same way as which low-skilled jobs are distributed in the base, which means that much of the income gains accrue to middle-income households.

A more realistic assumption is to say that jobs are allocated to those targeted by the policy, i.e. the unemployed or the youth. The flexibility afforded by a micro-simulation model allows for such a targeted policy impact to be simulated. Since unemployed individuals, who are now directly targeted in the micro-simulation model, are more likely to be living in the poorer households than employed persons, the micro-simulation model predicts greater declines in poverty than the micro-incidence model. In fact, in the youth-targeted scenario, the income gain among low-income households (deciles one to four) is in the region of 21 per cent compared to only 6 per cent in the micro-incidence model.

A wage subsidy policy can certainly be important in the fight against unemployment and poverty. Although the general subsidy modelled here may seem a fairly expensive policy option as opposed to, say, welfare transfers or minimum wages, there are many long-term benefits associated with a policy that brings people into employment where they gain skills and experience that will stand them in good stead in the future. It is crucial, however, that

employment responses are optimised by ensuring that the administrative processes are as simple and inexpensive as possible, particularly to smaller firms.

Limited participation by firms will reduce the employment generation potential, and evidence here suggests that the policy may be ineffective in reducing poverty significantly when the wage elasticity is low. The wage elasticity parameter may also be sensitive to the subsidy level in much the same way as it is sensitive to the minimum wage level (as discussed earlier). As such it is important that the actual wage subsidy offered is substantial enough to entice employers to participate.

The actual implementation of a wage subsidy policy will be crucial to its success. Of particular importance is the identification of the roles and responsibilities of relevant institutions. A detailed discussion falls beyond the scope of this study, but some preliminary ideas are raised. Firstly, government would need to decide on the responsibilities of several government departments. Wage subsidies could be considered a labour issue (Department of Labour), a welfare issue (Department of Social Development or the South African Social Security Agency) or an industry-level issue (Department of Trade and Industry). Given the financial implications, National Treasury and the South African Revenue Services would also have to be involved directly.

Outside of government, labour offices may be important in facilitating the processes of matching jobseekers and potential employers. As such, an institution such as the Umsobomvu Youth Fund may play a very important role in enhancing coordination between different active labour market policies, facilitating the job search process, and providing training and education opportunities to the youth. It is therefore crucial to develop the capacity at this institution (or other similar institutions) so that such a role can be fulfilled successfully. Ultimately, given the large potential number of stakeholder, a clear definition of roles and responsibilities of different government departments and institutions is crucial in order to ensure proper coordination and collaboration.

In conclusion, this study did not attempt to compare minimum wages and wage subsidies with the intention of choosing a more appropriate alternative. These policies are simply too different to compare directly. Minimum wages are easy to implement and require no direct funding from government. Rather than reducing poverty by addressing a labour market failure, they reduce poverty directly by raising earnings of the employed. However, this comes at the expense of employment losses and an overall decline in welfare. Wage subsidies, on the other hand, require funding. A larger subsidy programme is associated with higher costs and larger gains in terms of reductions in unemployment and poverty. It is for these reasons that the poverty-reducing effects of the two policies cannot be compared directly.

Wage subsidies are perhaps more flexible than minimum wages in that, through targeting, the poor unemployed can be targeted directly. About two-thirds of the unemployed are poor in any event, which means the policy will generally be quite effective at reaching poor people. Minimum wages, on the other hand, can only be targeted at existing workers. It was shown that only about half of sub-minimum wage workers were poor prior to the implementation of minimum wages in South Africa, which suggests that even in terms of its design this policy will be less effective at reaching the poor.

An area of contention for both policies is the issue of the effectiveness of the policy under different wage elasticity levels. Both theory and the evidence presented in this study suggest that minimum wages will be more successful in reducing poverty when the wage elasticity is low, while wage subsidies will generate superior poverty effects under a high wage elasticity scenario. Thus, if policymakers believe that the wage elasticity is relatively high (say $\eta = 0.7$), a case may be made to support wage subsidies but not minimum wages. The opposite may be true if policymakers believe the wage elasticity is relatively low (say $\eta = 0.3$).

The truth, however, is that the same wage elasticity level might not apply under both policies. International evidence suggests that when minimum wages are set at moderate levels and increases in the minimum wage are kept in check, employment responses are small, i.e., the effective wage elasticity level is low. Therefore, if minimum wages in South Africa continue to serve its purpose of providing a moral guideline to firms, employment losses could be kept low. Importantly, however, the job losses that do occur are likely to affect the poorest among the minimum wage workers, and for these people some alternative form of support is required. Similarly, under a carefully designed wage subsidy programme that is well managed, properly targeted and offers a reasonable subsidy to South African firms, the employment responses may be large and the poverty gains significant.

In conclusion, though, these policies should not be regarded as permanent solutions to a massive poverty and unemployment problem in South Africa. In the long run a focus on skills development and economic growth will remain the only sustainable solution to poverty and unemployment in South Africa.

References

- Adelman, I. and Robinson, S. (1978). *Income Distribution Policy: A Computable General Equilibrium Model of South Korea*. Stanford University Press: Stanford.
- Adelman, I. and Robinson, S. (1988). "Macroeconomic Adjustment and Income Distribution: Alternative Models Applied to Two Economies," *Journal of Development Economics*, 29: 23-44.
- Ahmed, V. and O'Donoghue, C. (2008). "CGE-Microsimulation Modelling: A Survey," *MPRA Paper No. 9307*. Munich Personal RePEc Archive.
- Aislabie, C.J. (1980). "Temporary Employment Subsidies in Industrialised Market Economies," *International Labour Review*, 119(6): 755-772.
- Armington, P.S. (1969). "A theory of demand for products distinguished by place of production," *IMF Staff Papers*, Vol. 16.
- Balcombe, K., Bailey, A., Morrison, J., Rapsomanikis, G. and Thirtle, C. (2000). "Stochastic biases in technical change in South African agriculture," *Agrekon*, 39(4): 495-503.
- Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z. and Woolard, I. (2007). "Why has unemployment risen in the new South Africa," *NBER Working Paper 13167*. National Bureau of Economic Research.
- Bell, T. and Cattaneo, N. (1997). "Foreign trade and employment in the South African manufacturing industry," *Occasional Report*, No. 4. Employment and Training Department, International Labour Organisation, Geneva.
- Bhorat, H. (2000). "Are Wage Adjustments and Effective Mechanism for Poverty Alleviation? Some Simulations for Domestic and Farm Workers," *DPRU Working Paper No. 00/41*. Development Policy Research Unit.
- Bhorat, H. (2008). "Unemployment in South Africa: Descriptors and Determinants," *Mimeo*.
- Bhorat, H. and Hodge, J. (1999). "Decomposing Shifts in Labour Demand in South Africa," *South African Journal of Economics*, 67(3): 348-380.
- Bhorat, H. and Kanbur, R. (2006a). "Introduction." In *Poverty and Policy in Post-Apartheid South Africa*, edited by Bhorat, H. and Kanbur, R. Cape Town: HSRC Press.
- Bhorat, H. and Kanbur, R. (Eds.) (2006b). *Poverty and Policy in Post-Apartheid South Africa*. HSRC Press: Cape Town.
- Bhorat, H. and Leibbrandt, M. (1996). "Understanding Unemployment. The Relationship between the Employed and the Jobless." In *Against the Current. Labour and Economic Policy in South Africa*, edited by Baskin, J. Randburg: NALEDI.
- Bhorat, H. and Leibbrandt, M. (2001). "Modelling Vulnerability and Low Earnings in the South African Labour Market." In *Fighting Poverty. Labour Markets and Inequality in South Africa*, edited by Bhorat, H., Leibbrandt, M., Maziya, M., Van der Berg, S. and Woolard, I. Cape Town: UCT Press.

- Bhorat, H., Leibbrandt, M., Maziya, M., Van der Berg, S. and Woolard, I. (2001). *Fighting Poverty. Labour Markets and Inequality in South Africa*. UCT Press: Cape Town.
- Bhorat, H. and Oosthuizen, M. (2004). "What Have We Learnt about the South African Labour Market?." Development Policy Research Unit, University of Cape Town.
- Bhorat, H., Oosthuizen, M. and Poswell, L. (2005). "The Post-Apartheid South African Economy in Perspective: Growth, Poverty and Economic Policy," *RBA Regional Project for Economic Policies in Support of MDGs and Poverty Reduction*. Development Policy Research Unit, University of Cape Town.
- Bhorat, H., Pauw, K. and Mncube, L. (2007a). "Understanding the Efficiency and Effectiveness of the Dispute Resolution System in South Africa: An Analysis of CCMA Data," *DPRU Research Report Commissioned by the Department of Labour*. Development Policy Research Unit, University of Cape Town.
- Bhorat, H., Van der Westhuizen, C. and Goga, S. (2007b). "Welfare Shifts in the Post-apartheid South Africa: A Comprehensive Measurement of Changes,," *DPRU Working Paper 07/128*. Development Policy Research Unit, University of Cape Town.
- Bird, K. and Manning, C. (2005). "Minimum Wages and Poverty in a Developing Country: Simulations from Indonesia's Household Survey," *Departmental Working Papers*, No. 2005-09. Department of Economics, Australian National University.
- Bourguignon, F. and Spadaro, A. (2005). "Microsimulation as a tool for evaluating redistribution policies," *Journal of Economic Inequality*, 4: 77-106.
- Bourguignon, F. and Ferreira, F. (2003). "Ex-Ante Evaluation of Policy Reforms using Behavioural Models." In *Evaluating the Poverty and Distributional Impact of Economic Policies: Techniques and Tools*, Second Draft, edited by Bourguignon, F. and Pereira da Silva, L.A. Washington: World Bank.
- Bourguignon, F. and Pereira da Silva, L.A. (2003). "Evaluating the Poverty and Distributional Impact of Economic Policies: Introduction to a compendium of existing techniques." In *Evaluating the Poverty and Distributional Impact of Economic Policies: Techniques and Tools*, 2nd draft, edited by Bourguignon, F. and Pereira da Silva, L.A. Washington: World Bank.
- Bourguignon, F., Pereira da Silva, L.A. and Stern, N. (2002). "Evaluating the Poverty Impact of Economic Policies: Some Analytical Challenges," published online at www.worldbank.org. World Bank.
- Branson, N. (2006). "The South African Labour Market 1995-2004: A Cohort Analysis," *SALDRU Working Paper No. 06/07*. Southern African Labour and Development Research Unit, University of Cape Town.
- Burger, R. and Burger, R. (2003). "Problems in the IES 2000," *Mimeo*. University of Stellenbosch.
- Burger, R. and Woolard, I. (2005). "The State of the Labour Market in South Africa after the First Decade of Democracy," *CSSR Working Paper No. 133*. Centre for Social Science Research, University of Cape Town.
- Burger, R. and Yu, D. (2006). "Wage trends in post-apartheid South Africa: Constructing an earnings series from household survey data," *Stellenbosch Economic Working Papers: 10/06*. Department of Economics, University of Stellenbosch.
- Burns, J. (2008). "Reducing Youth Unemployment in South Africa: Where to Intervene? ," *Mimeo*. University of Cape Town.
- Card, D. and Krueger, A.B. (1995). *Myth and Measurement: The New Economics of the Minimum Wage*. Princeton University Press: Princeton.

- Carter, M.R. and May, J. (2001). "One Kind of Freedom: Poverty Dynamics in Post-apartheid South Africa," *World Development*, 29(12): 1987-2006.
- Casale, D., Muller, C. and Posel, D. (2004). "Two million net new jobs? A reconsideration of the rise in employment in South Africa, 1995-2003," *South African Journal of Economics*, 72(5): 978-1002.
- Cockburn, J. (2006). "Trade Liberalisation and Poverty in Nepal: A Computable General Equilibrium Micro Simulation Analysis." In *Globalisation and Poverty: Channels and Policy Responses* edited by Bussolo, M. and Round, J. London: Routledge.
- Cockburn, J., Fofana, I., Decaluwe, B., Chitiga, M. and Mabugu, M. (2007). "A Gender-focused Macro-Micro Analysis of the Poverty Impacts of Trade Liberalization in South Africa," *Research on Economic Inequality*, 15: 269-305.
- Cogneau, D. and Robilliard, A. (2000). "Growth, Distribution and Poverty in Madagascar: Learning from a Microsimulation Model in a General Equilibrium Framework," *International Food Policy Research Institute (IFPRI): Trade and Macroeconomics Division Discussion Paper*, 61.
- Conradie, B. (2004). "Wages and wage elasticities for wine and table grapes in South Africa," *CSSR Working Paper No. 90*. Centre for Social Science Research, University of Cape Town.
- Daniels, L. (2006). "Social grant system can't be sustained," *The Mercury*. Durban.
- Davis, J. (2003). "Microsimulation, CGE and Macro Modelling for Transition in Developing Economies." Department of Economics, University of Western Ontario.
- De Boer, P. and Missaglia, M. (2006). "Estimation of income elasticities and their use in a CGE model for Palestine," *Econometric Institute Report EI 2006-12*. Erasmus School of Economics, Rotterdam, The Netherlands.
- Decaluwé, B., Patry, A., Savard, L. and Thorbecke, E. (1999). "Poverty Analysis Within a General Equilibrium Framework," *CRÉFA Working Paper*, 9909.
- Decaluwe, B., Yazid, D. and Robichaud, V. (2000). "Regionalization and Labour Market Rigidities in Developing Countries: A CGE Analysis of UEMOA," *Mimeo*. CREFA, Département d'économie, Université Laval, Québec, Canada.
- Department of Finance (1996). *Growth, Employment and Redistribution. A Macroeconomic Strategy*, Pretoria: Ministry of Finance.
- Department of Labour (1998). "Creating Jobs, Fighting Poverty: An Employment Strategy Framework," *Government Gazette No. 19040*. Department of Labour.
- Department of Social Development (2004). "Linking Social Grants Beneficiaries to Poverty Alleviation and Economic Activity," *Discussion Document*. Department of Social Development.
- Dervis, K., de Melo, J. and Robinson, S. (1982). *General Equilibrium Models for Development Policy*. Cambridge University Press: New York.
- Devarajan, S., Lewis, J.D. and Robinson, S. (1994). "Getting the Model Right: The General Equilibrium Approach to Adjustment Policy," *Mimeo*.
- Duflo, E. (2003). "Grandmothers and Granddaughters: Old-Age Pensions and Intrahousehold Allocation in South Africa," *The World Bank Economic Review*, 17(1): 1-25.
- Dunne, P. and Edwards, L. (2005). "Trade and Poverty in South Africa: Exploring the trade and employment linkage." Paper prepared for the Trade and Poverty Project. Available online at www.cssr.uct.ac.za/saldru.

- Edwards, L. and Golub, S. (2002). "South Africa's International Cost Competitiveness and Productivity: A Sectoral Analysis," *Report prepared for the South African National Treasury under a USAID/Nathan Associates SEGA Project*.
- Essama-Nssah, B., Go, D., Kearney, M., Korman, V., Robinson, S. and K., T. (2007). "Economy-wide and Distributional Impacts of an Oil Price Shock on the South African Economy. ," *Policy Research Working Paper No. 4354*. . World Bank
- Estudillo, J.P. (1997). "Income Inequality in the Phillipines, 1961-91," *The Developing Economies*, XXXV(1): 68-95.
- Everitt, B. (1974). *Cluster Analysis*. Heinemann Educational Books: London.
- Fallon, P.R. and Lucas, R. (1998). "South African Labor Markets: Adjustment and Inequalities," *World Bank Informal Discussion Papers on Aspects of the Economy of South Africa*, 12.
- Fedderke, J. (2006). "From chimera to prospect: South African sources of and constraints on long-term growth, 1970-2000." In *Poverty and Policy in Post-Apartheid South Africa*, edited by Borat, H. and Kanbur, R. Cape Town: HSRC Press.
- Fedderke, J. and Mariotti, M. (2002). "Changing Labour Market Conditions in South Africa: A Sectoral Analysis of the Period 1970-1997," *South African Journal of Economics*, 70(5): 830-864.
- Fields, G.S. and Kanbur, R. (2007). "Minimum wages and poverty with income-sharing," *Journal of Economic Inequality*, 5: 135-147.
- Fields, G.S., Leibbrandt, M. and Wakeford, J. (2000). "Key Labour Market Elasticities in South Africa. ." Report Commissioned by the South African National Department of Labour, Pretoria.
- Foster, J., Greer, J. and Thorbecke, E. (1984). "A Class of Decomposable Poverty Measures," *Econometrica* 52: 761- 765.
- Gibson, B. and Van Seventer, D. (2000). "The Tale of Two Models: Comparing Structuralist and Neoclassical Computable General Equilibrium Models for South Africa," *International Review of Applied Economics*, 14(2): 149-171.
- Go, D., Kearney, M., Korman, V., Robinson, S. and Thierfelder, K. (2009). "Wage Subsidy and Labour Market Flexibility in South Africa," *ERSA Working Paper No. 114*. Economic Research Southern Africa.
- Hamermesh, D.S. (1993). *Labor Demand*. Princeton University Press: Princeton.
- Heckman, J. (1979). "Sample selection bias as a specification error," *Econometrica*, 47: 153-161.
- Heintz, J. and Bowles, S. (1996). "Subsidising Employment. Wage Subsidies and Job Creation." In *Against the Current. Labour and Economic Policy in South Africa*, edited by Baskin, J. Randburg: NALEDI.
- Herault, N. (2006). "Building and Linking a Microsimulation Model to a CGE Model for South Africa," *South African Journal of Economics*, 74(1): 34-58.
- Hertz, T. (2002). "Forecasting the Effects of Pending Minimum Wage Legislation on Poverty in South Africa," *Mimeo*.
- Hertz, T. (2005). "The Effect of Minimum Wages on the Employment and Earnings of South Africa's Domestic Service Workers," *Development Policy Research Unit, Working Paper 05/99*.
- Holland, D.W., Bhattacharjee, S. and Stodick, L. (2006). "Assessing the Economic Impact of Minimum Wage Increases on the Washington Economy: A General Equilibrium Approach," *Working Paper Series 2006-12*. School of Economic Sciences, Washington State University.

- Hoogeveen, J.G. and Özler, B. (2006). "Poverty and inequality in post-apartheid South Africa: 1995 - 2000." In *Poverty and Policy in Post-Apartheid South Africa*, edited by Borat, H. and Kanbur, R. Cape Town: HSRC Press.
- ILO (2004). "Global Employment Trends for Youth." International Labour Organisation. Available online at www.ilo.org.
- IOE (2006). "Minimum Wage Policy Survey." International Organization of Employers.
- Katz, L.F. (1998). "Wage Subsidies for the Disadvantaged." In *Generating Jobs. How to Increase Demand for Less-Skilled Workers*, edited by Freeman, R.B. and Gottschalk, P. New York: Russel Sage Foundation.
- Keswell, M. and Poswell, L. (2004). "Returns to Education in South Africa: A Retrospective Sensitivity Analysis of the Available Evidence," *South African Journal of Economics*, 72(4): 834-860.
- Kilkenny, M. (1991). "Computable General Equilibrium Modeling of Agricultural Policies: Documentation of the 30-Sector FPGE GAMS Model of the United States." USDA ERS Staff Report AGES 9125.
- King, B.J. (1985). "What is a SAM?" In *Social Accounting Matrices: A Basis for Planning*, edited by Pyatt, G. and Round, J. Washington D.C.: World Bank.
- Kingdon, G.G. and Knight, J. (2000). "Unemployment in South Africa: The Nature of the Beast." *Paper presented at the Trade and Industrial Policy Strategies Annual Forum*, Muldersbush.
- Klasen, S. and Woolard, I. (1997). "Who are the Unemployed Poor?," *Input paper for the Poverty and Inequality Report*.
- Klasen, S. and Woolard, I. (2005). "Surviving unemployment without state support: Unemployment and household formation in South Africa," *CSSR Working Paper No. 129*. Centre for Social Science Research, University of Cape Town.
- Kuhn, P. (2004). "Is Monopsony the Right Way to Model Labor Markets? A Review of Alan Manning's Monopsony in Motion," *International Journal of the Economics of Business*, 11(3): 369-378.
- Laitner, J.A., DeCanio, S.J. and Peters, I. (2000). "Incorporating Behavioral, Social and Organizational Phenomena in the Assessment of Climate Change Mitigation Options," *Prepared for the IPCC Meeting Conceptual Frameworks for Mitigation Assessment from the Perspective of Social Science*. Karlsruhe, Germany.
- Leibbrandt, M., Levinsohn, J. and McCrary, J. (2005a). "Income in South Africa Since the Fall of Apartheid," *National Bureau of Economic Research, Working Paper 11384*.
- Leibbrandt, M., Poswell, L., Naidoo, P., Welch, M. and Woolard, I. (2005b). "Measuring Recent Changes in South Africa Inequality and Poverty using 1996 and 2001 Census Data." Centre for Social Science Research Working Paper No. 84, Cape Town.
- Leibbrandt, M., Woolard, I. and Borat, H. (2001). "Understanding contemporary household inequality in South Africa." In *Fighting Poverty. Labour Markets and Inequality in South Africa*, edited by Borat, H., Leibbrandt, M., Maziya, M., Van der Berg, S. and Woolard, I. Cape Town: UCT Press.
- Levinsohn, J. (2008). "Two Policies to Alleviate Unemployment in South Africa," *CID Working Paper No. 166*. Centre for International Development, Harvard University.
- Lewis, J.D. (2001). "Policies to Promote Growth and Employment in South Africa." World Bank, Washington.
- Litchfield, J.A. (1999). "Inequality: Methods and Tools," published online at <http://www.worldbank.org/poverty/inequal/index.htm>. World Bank.

- Loewald, C. and Fletcher, K. (2001). "The economic impact of wage subsidies," *National Treasury Unpublished Memo*. National Treasury.
- Löfgren, H., Harris, R.L. and Robinson, S. (2001). "A Standard Computable General Equilibrium (CGE) Model in GAMS," *International Food Policy Research Institute (IFPRI): Trade and Macroeconomics Division Discussion Paper*, 75.
- Löfgren, H., Robinson, S. and El-Said, M. (2003). "Poverty and Inequality in a General Equilibrium Framework: The Representative Household Approach." In *Evaluating the Poverty and Distributional Impact of Economic Policies: Techniques and Tools*, edited by Bourguignon, F. and Pereira da Silva, L.A. Washington: World Bank.
- Lysy, F. and Taylor, L. (1980). "The General Equilibrium Model of Income Distribution." In *Models of Growth and Distribution for Brazil*, edited by Taylor, L., Bacha, E., Cardoso, E. and Lysy, F. Oxford: Oxford University Press.
- Manuel, T. (2008). *Budget Speech, 20 February 2008*: National Treasury.
- Matisonn, H. and Seekings, J. (2001). "The Politics of a Basic Income Grant in South Africa, 1996-2002." In *A Basic Income Grant for South Africa*, edited by Standing, G. and Samson, M.: University of Cape Town Press.
- May, J. (Ed.) (2000). *Poverty and Inequality in South Africa: Meeting the Challenge*. David Phillip Publishers: Cape Town.
- Maziya, M. (2001). "Contemporary Labour Market Policy and Poverty in South Africa." In *Fighting Poverty. Labour Markets and Inequality in South Africa*, edited by Bhorat, H., Leibbrandt, M., Maziya, M., Van der Berg, S. and Woolard, I. Cape Town: UCT Press.
- Mbeki, T. (2008). "State of the Nation Address of the President of South Africa, Thabo Mbeki: Joint Sitting of Parliament," published online at <http://www.info.gov.za/speeches/2008/08020811021001.htm>.
- McConnel, C.R. and Brue, S.L. (1999). *Economics. Principles, Problems and Policies*, 14th Edition. Irwin McGraw-Hill: Boston.
- McCord, A. (2008). "Training within the South African national public works programme." In *Human Resources Development Review 2008*, edited by Kraak, A. and Press, K. Pretoria: HSRC Press.
- McCulloch, N., Winters, L.A. and Cirera, X. (2001). *Trade Liberalisation and Poverty: A Handbook*. Centre for Economic Policy Research: London.
- McDonald, S. (2006). *STAGE Static CGE Model V1*.
- Meth, C. (2006). "What was the poverty headcount in 2004 and how does it compare to recent estimates by van der Berg et al?," Unpublished Report.
- National Treasury (2001). "Budget Review 2001." National Treasury, Pretoria.
- National Treasury (2007). "Budget Review 2007." National Treasury, Pretoria.
- Nattrass, N. (2000). "The Debate about Unemployment in the 1990s," *Studies in Economics and Econometrics*, 24(3): 73-90.
- Nganou, J.N. (2004). "Estimating the Key Parameters of the Lesotho CGE Model." *Paper presented at the International Conference on Input-Output and General Equilibrium: Data, Modeling, and Policy Analysis*, 2-4 September 2004, Brussels, Belgium.

- Oosthuizen, M. (2005). "The Post-Apartheid Labour Market: 1995 -2004." Development Policy Research Unit, University of Cape Town.
- Orcutt, G. (1957). "A new type of socio-economic system," *Review of Economics and Statistics*, 58: 773-797.
- Paton, C. (2009). "The Great Pension Fund Reform," *FM Cover Story*. Financial Mail.
- Pauw, K. (2002). *Evaluating the General Equilibrium Effects of a Wage Subsidy Scheme for South Africa*. Masters Dissertation, School of Economics, University of Cape Town.
- Pauw, K. (2003). "Multivariate Statistical Techniques," *PROVIDE Background Paper Series*, 2003:1. PROVIDE Project, Elsenburg. Available online at www.elsenburg.com/provide.
- Pauw, K. (2005a). "Creating an IES-LFS 2000 Database in Stata," *PROVIDE Technical Paper Series*, 2005:1. PROVIDE Project, Elsenburg. Available online at www.elsenburg.com/provide.
- Pauw, K. (2005b). "Forming Representative Household and Factor Groups for a South African SAM," *PROVIDE Technical Paper Series*, 2005:2. PROVIDE Project, Elsenburg. Available online at www.elsenburg.com/provide.
- Pauw, K. (2007). "Farming for Food or Farming for Money," *Agrekon*, 46(2): 195-217.
- Pauw, K., Bhorat, H. and Mncube, L. (2008a). "Minimum Wages, Employment and Household Poverty: Investigating the Impact of Sectoral Determinations," *DPRU Research Report* Commissioned by the Department of Labour.
- Pauw, K. and Edwards, L. (2006). "Evaluating the General Equilibrium Effects of a Wage Subsidy Scheme for South Africa," *South African Journal of Economics*, 74(3): 442-462.
- Pauw, K., Edwards, L. and Leibbrandt, M. (2007a). "Trade-induced employment changes: Promising or problematic for poor households in South Africa?," *Studies in Economics and Econometrics*, 31(2): 89-108.
- Pauw, K. and McDonald, S. (2006). "The welfare impacts of targeted transfers to poor households." *Paper presented at the 9th Annual Conference on Global Economic Analysis*, 15 - 17 June 2006, Addis Ababa, Ethiopia.
- Pauw, K., McDonald, S. and Punt, C. (2007b). "Agricultural Efficiency and Welfare in South Africa," *Development Southern Africa*, 24(2).
- Pauw, K. and Mncube, L. (2007). "The Impact of Growth and Redistribution on Poverty and Inequality in South Africa," *Cash Transfer Research Programme*, Country Study No. 7. International Poverty Centre, United Nations Development Programme. Available online at www.undp-povertycentre.org/pub/IPCCountryStudy7.pdf.
- Pauw, K., Oosthuizen, M. and Van der Westhuizen, C. (2006). "Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox," *DPRU Working Paper*, No. 06/114. Development Policy Research Unit, University of Cape Town.
- Pauw, K., Oosthuizen, M. and Van der Westhuizen, C. (2008b). "Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox " *South African Journal of Economics*, 76(1): 45-57.
- Phelps, E.S. (1994). "Low-wage Employment Subsidies versus the Welfare State," *American Economic Review Papers and Proceedings*, 84(2): 54-58.
- Pollin, R., Epstein, G., Heintz, J. and Ndikumana, L. (2006). *An Employment-Targeted Economic Program for South Africa*. International Poverty Centre, United Nations Development Policy: Brasilia.

- Poswell, L. (2003). "Comments on Income and Expenditure Survey 2000." Development Policy Research Unit, Cape Town.
- PROVIDE (2005). "The PROVIDE Project Standard Computable General Equilibrium Model. Version 2.," *PROVIDE Technical Paper Series*, 2005:3. PROVIDE Project, Elsenburg. Available online at www.elsenburg.com/provide.
- PROVIDE (2006). "Compiling National, Multiregional and Regional Social Accounting Matrices for South Africa," *PROVIDE Technical Paper Series*, 2006:1. PROVIDE Project, Elsenburg. Available online at www.elsenburg.com/provide.
- Pyatt, G. (1998). "A SAM Approach to Modelling," *Journal of Policy Modelling*, 10: 327-352.
- Rankin, N. (2009). *Director: African Micro-Economic Research Umbrella*.
- Robilliard, A., Bourignon, F. and Robinson, S. (2001). "Crisis and Income Distribution: A Micro-Macro Model for Indonesia." World Bank.
- Robinson, S. (1989). "Multisectoral Models." In *Handbook of Development Economics*, edited by Chenery, H. and Srinivasan, T.N. Amsterdam: North Holland.
- Robinson, S., Kilkenny, M. and Hanson, K. (1990). "USDA/ERS Computable General Equilibrium Model of the United States." USDA ERS Staff Report AGES 9049.
- Savard, L. (2003). "Poverty and Income Distribution in a CGE-Household Micro-Simulation Model: Top-Down/Bottom Up Approach," *CIRPÉE Working Paper 03-43*. Centre interuniversitaire sur le risque, les politiques économiques et l'emploi.
- Savard, L. (2004). "Poverty and Inequality Analysis within a CGE Framework: a Comparative Analysis of the Representative Agent and Micro-Simulation Approaches," *CIRPÉE Working Paper No. 04-12*. Centre interuniversitaire sur le risque, les politiques économiques et l'emploi.
- Shapiro, C. and Stiglitz, J. (1984). "Equilibrium Unemployment as a Worker Discipline Device," *The American Economic Review*, 74(3): 433-444.
- Simkins, C. (2003). "A Critical Assessment of the 1995 and 2000 Income and Expenditure Surveys as Sources of Information on Incomes," *Mimeo*.
- Smith, C. (2006). "International Experience with Worker-side and Employer-side Wage and Employment Subsidies, and Job Search Assistance Programmes: Implications for South Africa," *Employment Growth and Development Initiative*. Human Science Research Council.
- Smith, M.J., Jennings, R. and Solanki, G. (2005). "Perspectives on Learnerships: a critique of South Africa's transformation of apprenticeships," *Journal of Vocational Education and Training*, 57(4): 539-564.
- SSA (1997a). *Household Income and Expenditure Survey, 1995*, Pretoria: Statistics South Africa.
- SSA (1997b). *October Household Survey, 1995*, Pretoria: Statistics South Africa.
- SSA (2002a). "Earning and spending in South Africa. Selected findings and comparisons from the income and expenditure surveys of October 1995 and October 2000." Statistics South Africa, Pretoria.
- SSA (2002b). *Income and Expenditure Survey 2000*, Pretoria: Statistics South Africa.
- SSA (2002c). *Labour Force Survey September 2000*, Pretoria: Statistics South Africa.
- SSA (2006). *Labour Force Survey, September 2005*, Pretoria: Statistics South Africa.

- Stone, R. (1954). "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand," *The Economic Journal*, 64(255): 511-527.
- Taylor, V. (2002). "Transforming the Present - Protecting the Future.," *Report of the Committee of Inquiry into a Comprehensive System of Social Security for South Africa*.
- Thurlow, J. (2007). "Trade Liberalisation and Pro-Poor Growth in South Africa," *Studies in Economics and Econometrics*, 31(2): 161-179.
- Thurlow, J. and Van Seventer, D.E. (2002). "A Standard Computable General Equilibrium Model for South Africa," *International Food Policy Research Institute: TMD Discussion Paper*, 100.
- Torres, L., Bhorat, H., Leibbrandt, M. and Cassim, F. (2000). "Poverty and the labour market." In *Poverty and Inequality in South Africa: Meeting the Challenges*, edited by May, J. Cape Town: David Phillip Publishers.
- UNDP (2003). *South African Human Development Report 2003: The Challenge of Sustainable Development*. Oxford University Press: UNDP South Africa.
- UNDP (2007). *Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World*. United Nations Development Programme.
- Van der Berg, S. (2005). "Fiscal expenditure incidence in South Africa, 1995 and 2000," *A report for the National Treasury*. Department of Economics, University of Stellenbosch.
- Van der Berg, S., Burger, R., Burger, R., Louw, M. and Yu, D. (2005). "Trends in poverty and inequality since the political transition " *Paper presented at the TIPS/DPRU Forum 2005*, 30 November - 1 December 2005, Glenburn Lodge, Gauteng.
- Van der Berg, S. and Louw, M. (2004). "Changing Patterns of South African Income Distribution: Towards Time Series Estimates of Distribution of Poverty," *South African Journal of Economics*, 72(3): 546-572.
- Van der Berg, S., Nieftagodien, S. and Burger, R. (2004). "Consumption Patterns of South Africa's Rising Black Middle-Class: Correcting for Measurement Errors." *Paper presented at the CSAE conference on Poverty Reduction, Growth and Human Development in Africa, Oxford, March 2004*, March 2004,
- Van der Westhuizen, C., Goga, S. and Oosthuizen, M. (2007). "Women in the South African Labour Market: 1995 - 2005," *DPRU Working Paper 07/118*. Development Policy Research Unit, University of Cape Town. Available online at www.commerce.uct.ac.za/dpru.
- Woolard, I. (1998). "A Comparison of Urban Poverty," *Chapter prepared for the Poverty and Inequality Report*, edited by May, J.
- Yu, D. (2008). "The comparability of Income and Expenditure Surveys 1995, 2000 and 2005/2006," *Stellenbosch Economic Working Papers: 11/08*. Department of Economics, University of Stellenbosch.
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Appendix

1. Poverty Measurement and Trends

Some uncertainty and controversy exists around the issue of whether South Africa has in fact experienced an increase or a decrease in poverty during the past decade. Although this issue is not central to the theme of this paper, a consideration of the literature here is appropriate. Before summarising the findings on welfare or poverty trends (section 1.2), a brief explanation of how income poverty is generally measured is provided in the following section.

1.1. Measuring Income Poverty

Income poverty is best measured using the Foster-Greer-Thorbecke (FGT) poverty measure. The functional form of this poverty measure is shown in equation [A.1] below:

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left(\frac{z - y_i}{z} \right)^{\alpha} \quad [A.1]$$

In this equation the variable y_i is the welfare measure that can be compared against the poverty line, z . The FGT measure is defined over a population of n people, $i = 1, \dots, n$. If ranked by their income or welfare measure, individuals ranked the first q ($i = 1, \dots, q$) are classified as poor due to the fact that $y_i < z$. The remaining $(n - q)$ ($i = q + 1, \dots, n$) individuals are non-poor since $y_i \geq z$. The parameter α is called the poverty aversion parameter and can take on any value greater or equal to one, but in practice $\alpha = 0, 1$ or 2 is most frequently used. These three measures represent the poverty headcount index (P_0), the poverty gap index (P_1) and the poverty gap squared (P_2) respectively.

The poverty aversion parameter (α) in the FGT poverty measure shown previously in equation [A.1] can take on any value greater than zero, but often in practice values of $0, 1$ and 2 are selected. When $\alpha = 0$, P_{α} simply reduces to $P_0 = q/n$, where q is the number of poor. It thus represents the share of the population that is poor. This ‘poverty headcount’ is completely insensitive to the depth of poverty, i.e. it does not consider how far on average people are from the selected poverty line.

When $\alpha = 1$ the above equation sums the relative poverty gap over the poor population. P_1 , also known as the poverty gap index, therefore measures the average depth of poverty, as it is a function of both the distance of each poor household from the poverty line and the number

of poor. Woolard (1998) points out that P_1 has a number of advantages over P_0 . Since P_0 is discontinuous at the poverty line, a transfer from a very poor household to a just-poor household that enables the just-poor household to escape poverty will reduce the headcount ratio. This is a violation of the Pigou-Dalton condition. Since P_1 is continuous and concave, such a transfer will increase the poverty gap index. However, P_1 nevertheless neglects inequality among the poor. A transfer from one poor household to another will have no impact on P_1 , provided the receiving household remains poor after the transfer.

P_2 is also a measure of the depth of poverty. It improves on P_0 and P_1 because it also takes into account the inequality among the poor. In fact, it can be shown that P_2 can be decomposed into two components, namely an amount due to the poverty gap, and an amount due to the inequality among the poor as measured in terms of the coefficient of variation (Woolard, 1998). Thus,

$$P_2 = \frac{(P_1)^2}{P_0} + \frac{(P_0 - P_1)^2}{P_0} (C_q)^2 \quad [\text{A.2}]$$

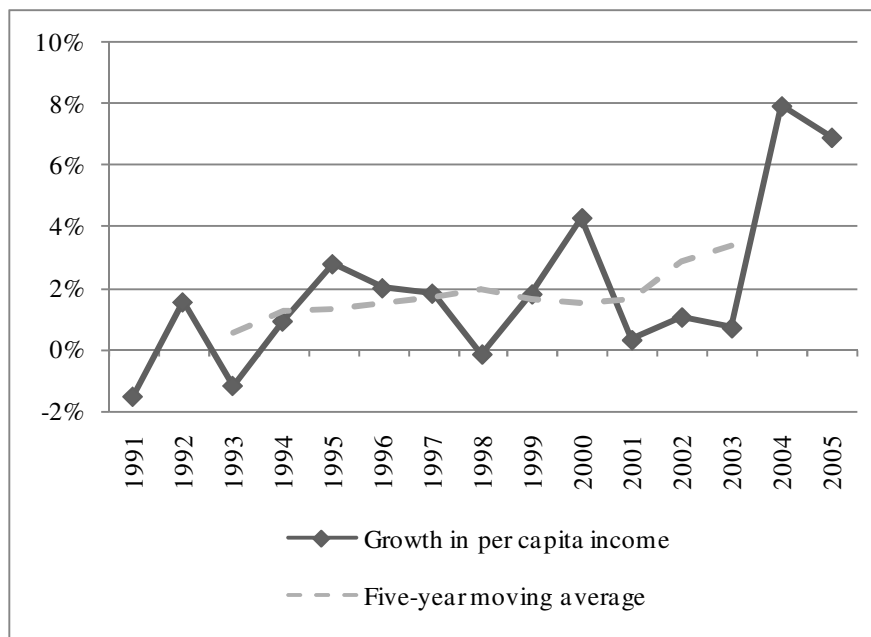
where C_q denotes the coefficient of variation of income among the poor. Woolard (1998) explains that although this breakdown goes partway in explaining the meaning of P_2 , it remains difficult to interpret the measure on its own. One of the advantages of P_2 , however, is that an increase in the measured poverty associated with a fall in the living standard will be deemed greater the poorer the household. Put differently, people further away from the poverty line are given a greater weighting in the poverty measure due to the fact that the poverty gap is squared when $\alpha = 2$.

1.2. Poverty Trends in the Post-Apartheid Period

The question about whether poverty levels have increased or decreased in the decade since the end of apartheid is a topical and even controversial one. Macroeconomic data published in the national accounts of the South African Reserve Bank suggest that both current household income (expressed in per capita terms) and per capita GDP grew consistently in real terms between 1995 and 2005. Appendix Figure 1 shows the year-on-year growth rate of per capita household income as calculated from the national accounts.⁸⁸ According to these estimates, real per capita household incomes have been growing at between 1 and 2 per cent per annum over the period 1995 to 2000, where after the average growth rate improved even further.

⁸⁸ Mid-year population estimates published annually by Statistics South Africa were used to obtain per capita estimates.

Appendix Figure 1: Real Growth in Per Capita Current Household Income, 1990 - 2005



Source: National Accounts Data, SARB Quarterly Bulletin (September 2006)

Two key datasets for poverty and inequality analyses in the post-apartheid have been the IES 1995 and 2000. Although data problems and the comparability of these two datasets have been important discussion points ever since the IES 2000 was released,⁸⁹ a comparison of these two datasets, taken at face value, suggests there was actually a decline in average household income and an increase in poverty between 1995 and 2000 (compare results in Table 2.1). Leibbrandt et al. (2005a) note that discrepancies between household survey data and national accounts are not uncommon. When weighted to national levels, household survey data often yields lower aggregate income estimates than those reported in national accounts. The concern here, however, is the fact that the per capita income trends in the national accounts and household surveys seem to contradict each other. Appendix Table 1 summarises findings of some of the key post-apartheid era studies on incomes, poverty and inequality. Most of these studies compare data from the IES/OHS 1995 and IES/LFS, while National Census data from 1996 and 2001 was also used. Van der Berg and Louw (2004) and Van der Berg et al. (2005) generated some controversy with the use of hybrid data sets (see below).

A decline in average per capita or household incomes between 1995 and 2000 is a universal finding across the studies that report on incomes. The Statistics South Africa report estimates the decline in household income at around 11.8 per cent (SSA, 2002a).⁹⁰ Leibbrandt et al.'s

⁸⁹ See section 3.1 in the Appendix.

⁹⁰ Earlier in Table 2.1 per capita income estimates were also shown to have declined across all the household quintiles. This decline was particularly pronounced in the poor quintiles, where the average decline was 19 per cent. In contrast non-poor per capita incomes declined by only 1 per cent. The data

(2005a) study focuses specifically on shifts in the income distribution. Their analysis is limited to individuals aged 18 and older with ‘valid’ demographic information and sampling weights, as well as positive income.⁹¹ A leftward shift in the income distribution is evident throughout the distribution with the exception of the highest income earners. At the average, the decline in income is about the same magnitude as inflation (around 6.7 per cent per annum), which means nominal incomes have remained roughly constant. Leibbrandt et al. (2005a:15) also compare the distribution of the share of food expenditure between the two periods and find a dramatic shift to the right, which “*is entirely consistent with a substantial decline in real income*”.

In another study based on National Census data from 1996 and 2001, Leibbrandt et al. (2005b) confirm the leftward shift in the real per capita income distribution. This shift, they show, is “*particularly pronounced in the middle and lower-income sections of the distribution*”.⁹² The evidence that lower-income earners had been affected worse by income declines between 1995/6 and 2000/1 points at worsening inequality. In fact, all the studies listed in Appendix Table 1 find that inequality had increased between 1995 and 2000.

The results on changes in poverty vary widely, although the consensus seems to lean towards a worsening of poverty between 1995 and 2000. This increase in poverty is perhaps less clear at ‘normal’ poverty lines; for example, at Hooegeveen and Özler’s (2006) lower bound poverty line of R322 per capita per month, poverty remains unchanged at 58 per cent. However, the increase in poverty becomes more evident at lower poverty lines. For example, at the \$2 per day poverty line both the studies of Hooegeveen and Özler (2006) and Leibbrandt et al. (2005b) show an increase in poverty headcount rate (from 32 to 34 per cent and 26 to 28 per cent respectively) using different datasets. The UNDP (2003) study also finds that poverty had increased at an ‘extreme poverty’ line of \$1 per day. Worsening inequality and relatively larger income declines among the very poor has also meant that the depth of poverty had increased. Hooegeveen and Özler (2006), for example, show that at the \$2 per day

presented in Table 2.1 suggest that in real terms, the average South African earned 9 per cent less in 2000 compared to 1995.

91 This approach is an alternative to the approach whereby individual incomes (wages, pension income and so on) and household incomes (non-wage sources, e.g. remittance income) are first aggregate at the household level and then allocated uniformly across household members.

92 Much of Leibbrandt et al.’s (2005a) paper is dedicated to explaining the leftward shift in the income distribution. One explanation, they argue, is that returns to education had declined between 1995 and 2000, which seems consistent with evidence presented in Chapter 2. Another possibility is issue of the selection of observations into the survey dataset. Even though the 1995 and 2000 samples were designed to be random and unbiased, differences in selection into the survey sample may explain changes in income. Related is the issue of selection into the subset of income earners in the sample. For example, the authors find that income ‘reciprocity’ rates among White men have declined, while they have increased for Black women. If the incomes of Black women are now lower, on average, than those of White men, the changes in ‘reciprocity’ rates explain the decline in average incomes.

poverty line the average poor household earned 11 per cent less than the poverty line in 1995, but that this poverty gap (P_1) had increased to 13 per cent by 2000.

Van der Berg and Louw (2004) and Van der Berg et al. (2005) follow a very different approach, essentially building up datasets for the analysis of poverty trends from a variety of sources. These combined datasets are benchmarked against national accounts estimates of macroeconomic trends and hence the authors perceive them to be more plausible for studying poverty trends than household survey or census data. In both the studies, micro-level data is obtained from a variety of sources, including for example the Standardised Employment Series, OHSs and LFSs (wage and employment data), Department of Social Development (welfare transfer data), and the Bureau of Market Research (property income data). Van der Berg and Louw (2004) obtain income distribution data from the IES/OHS 1995 and IES/LFS 2000, while Van der Berg et al.'s (2005) work is unique in using the All Media Products Surveys (published by the South African Advertising Research Foundation) as the source of data on income distributions. What further makes Van der Berg et al.'s (2005) work unique among the studies referred to here is the fact that their methods allow them to also present results for the period 2000 to 2004. As far as the results for 1995 to 2000 is concerned, they find (like many others) a marginal increase in the poverty headcount rate. However, they claim that poverty as measured against a poverty line of R3 000 (2000 prices) declined by about 8 percentage points between 2000 and 2004 (from 41.3 to 33.2 per cent of the population).

In a recent report Yu (2008) compares income and expenditure estimates across the three IES surveys, i.e. 1995, 2000 and 2005/06. Yu explains that the 1995 and 2000 editions used the recall method to collect income and expenditure data, whereas in 2005/06 a diary method was adopted. In addition to this, the latter survey also differed from its predecessors in terms of sampling design, questionnaire structure, expenditure categorisation, and so on. This requires some modification or reclassification of income and expenditure items to allow for comparisons to be made across the three surveys. Although direct comparisons will always remain somewhat tenuous, Yu's (2008) findings corroborate those of Van der Berg et al. (2005) in suggesting that incomes rose and poverty declined rapidly between 2000 and 2005/06. The exact extent of these changes depends on how income and expenditure estimates are reclassified in order to facilitate such comparisons.

Appendix Table 1: Summary of Income, Inequality and Poverty Findings, 1995-2005/06

	Income		Inequality		Poverty		Data Source
SSA (2002a)	↓	Average household income declined by 11.8 per cent.	↑	Gini coefficient increased from 0.56 to 0.57 between 1995 and 2000.	-	-	IES 1995, 2000
Hoogeveen & Özler (2006)	-	-	↑	Gini coefficient increased from 0.565 to 0.577 between 1995 and 2000. The mean log deviation and Theil index also show increases in inequality.	↑ / →	Depending on poverty line: For \$2 per day poverty line poverty increases from 32 per cent to 34 per cent between 1995 and 2000, while for the 'lower bound poverty line' it remains virtually unchanged at 58 per cent.	IES 1995, 2000
Leibbrandt et al. (2005a)	↓	Average fall in incomes by roughly the same magnitude as inflation.	-	-	-	-	IES/OHS 1995, IES/LFS 2000
UNDP (2003)			↑	Gini coefficient increased from 0.596 to 0.635 between 1995 and 2002.	↓ / ↑	Depending on poverty line: National food poverty line shows decline in poverty from 51.1 per cent to 48.5 per cent between 1995 and 2002. Also decline for \$2 per day, but increase from 9.4 per cent to 10.5 per cent for \$1 per day extreme poverty line.	IES 1995; Unknown
Leibbrandt et al. (2005b)	↓	Leftward shift in the entire income distribution, particularly pronounced in the middle- to lower sections of the distribution.	↑	Gini coefficient increased from 0.68 to 0.73 between 1995 and 2000.	↑	Poverty increased from 26 to 28 per cent at the \$2 per day poverty line, and from 50 to 55 per cent at the R250 per capita per month poverty line	Census 1996 and 2001
Van der Berg and Louw (2004)	-	-	↑	Increases in inequality within all racial groups, namely 0.57 to 0.59 for Africans, 0.52 to 0.55 for Coloureds, 0.49 to 0.51 for Indians and 0.47 to 0.49 for Whites.	↓	Falls under both the 'pessimistic' and 'optimistic' scenarios, from 38.8 per cent in 1995 to 38.6 or 36.4 per cent in 2000 at a poverty line of R3 000 per capita per annum.	Standard Employment Series, OHS, LFS, IES (various years)
Van der Berg et al. (2005)	-	-	↓	Decline in inequality among the Black population since 2000	↑ / ↓	Initially increased from 40.6 per cent in 1993 to 41.3 per cent in 2000, but thereafter declined to 33.2 per cent in 2004 at a poverty line of R3 000 per capita per annum.	Standard Employment Series, OHS, LFS, AMPS (various years)
Yu (2008)*	↑ / ↓	Aggregate household income declines 12.8 per cent between 1995 and 2000; then rises 43.1 per cent increase from 2000 to in 2005/06. Net increase of 24.9 per cent over ten-year period.	↑ / ↓	Gini worsens from 0.66 to 0.71 between 1995 and 2000, declines (increases) marginally when imputed rent is excluded (included).	↑ / ↓	At R3 864 poverty line (2000 prices) poverty rises from 43.8 to 56.4 per cent between 1995 and 2000, then drops to 49.7 (46.7) per cent when imputed rent is excluded (included).	IES 1995, 2000 and 2005/06

Sources: Sources as referenced. Table adapted from Pauw and Mncube (2007).

As expected, the results by Van der Berg et al. (2005) were received very favourably by government. However, the authors were vehemently criticised for their methods from within the academic fraternity. Meth (2006) counts as perhaps the most vociferous of the critics.⁹³ Nevertheless, Van der Berg et al. (2005:22) suggest that these are their “*conservative estimates*” and that the “*true conclusion regarding the extent of poverty in South African may be even more optimistic than the one drawn*”. They attribute the much improved outlook on two factors, namely large-scale expansion of the social welfare grants⁹⁴ as well as favourable economic growth and the associated employment creation. The latter has caused a turnaround in the trend of rising unemployment that was seen prior to 2000.

In conclusion, then it seems fair to suggest that poverty levels, and especially extreme poverty levels and the depth of poverty increased between 1995 and 2000. Although evidence of an overall decline in welfare levels stands in contrast to national accounts data, Leibbrandt et al. (2005a) note that “*results using the survey data are replicable, and all the inputs – principally survey responses and sampling weights – are explicit and available, hence yielding a relatively transparent and replicable methodology*”. This is not the case with South Africa’s national accounts data, and consequently the consensus position has to be that poverty did in fact increase between 1995 and 2000 (Bhorat and Kanbur, 2006a). Early evidence suggests a turnaround in this trend of rising poverty since 2000. The high correlation between poverty and unemployment, coupled with the decline in unemployment since 2002 and the rapid increase in means-tested welfare payments (see Chapter 2) all seems to suggest that a decline in poverty is not an unexpected outcome.

2. Technical Information: Models

2.1. Computable General Equilibrium Model

This study makes use of the Standard General Equilibrium (STAGE) model developed by McDonald (2006). The STAGE model is a member of the class of single country CGE models that are descendants of the approach to CGE modelling described by Dervis et al. (1982). More specifically, the implementation of this model, using the GAMS (General Algebraic Modelling System) software, is a direct descendant and development of models devised in the late 1980s and early 1990s, particularly those models reported by Robinson et

⁹³ Meth’s (2006) major critique is against the scaling up of income and expenditure estimates to national accounts levels, something Van der Berg et al. (2005) justify on the basis of underreporting in the surveys and/or AMPS data. Meth (2006) uses LFS September 2004 data (which in itself has been questioned by others given inadequate capturing of non-wage income sources in the LFS datasets) and shows that he is only able to start replicating Van der Berg et al.’s (2005) results when he allows for underreporting of between 38 and 50 per cent. This, he argues, seems excessive.

⁹⁴ Welfare transfer payments have increased by more than a 70 per cent in real terms between 2000 and 2004 (see Pauw and Mncube, 2007 for an in-depth analysis)

al. (1990), Kilkenny (1991) and Devarajan et al. (1994). Following Pyatt's (1998) 'SAM approach to modelling', the model is calibrated with a SAM for South Africa. This SAM, with base-year 2000, was compiled by the PROVIDE Project (PROVIDE, 2006).

2.1.1. *Social Accounting Matrices*

Social Accounting Matrices (SAMs) have become the database of preference for most economy-wide models. Initial theoretical developments in social accounting are largely attributable to Sir Richard Stone who addressed the matter of integrating disaggregated production accounts (in the form of input-output systems) into the national accounts. The aim was to form an economy-wide database, which not only included information about productive activities in the economy, but also incorporated other non-productive institutions and markets, such as factor markets, capital markets, households, government, and the rest of the world. A SAM can therefore be described as a "*comprehensive, economy-wide data framework*" (Löfgren et al., 2001:2).

A SAM has two principle objectives (King, 1985). The first is to organise information about the economic and social structure of an economy in a specific period (usually one calendar year). When economic agents are involved in transactions with each other, financial resources exchange hands. The SAM captures all the financial resource flows in the economy associated with economic transactions and presents it in an organised matrix framework. SAM accounts representing economic agents or markets make up the rows and columns of the matrix, with the basic rule being that incomes are shown in the rows and expenditures in the columns of the SAM (see Appendix Table 2). This accounting procedure ensures completeness and consistency in a SAM; the value and direction of the resource flows associated with all economic transactions that have taken place during the accounting period are captured in this data framework.

The second principle objective of a SAM is to provide the statistical basis for the creation of plausible economy-wide models. Since a SAM forms a complete database of all economic transactions, is consistent with the national accounts and upholds all macroeconomic balances inherent to the economy (the SAM row and column totals are consistent), it presents a very useful 'static image' or 'snapshot picture' of the structure of an economy. It is therefore the database of choice for calibrating general equilibrium or economy-wide models.

The SAM accounts, representing economic agents in the model, can be grouped into six types of accounts, namely production activities, commodity markets, factor markets, current accounts of domestic institutions (households, government and incorporated business enterprises), a capital account (savings and investments) and a rest of the world account. These accounts as well as the associated transactions that may take place between economic

agents are summarised in Appendix Table 2. The SAM shown here is a macro-SAM, but usually in practical applications each of these macro-accounts is disaggregated further. The extent of the disaggregation depends on data availability and requirements of the study. Disaggregated activity and commodity accounts reflect the diverse nature of production activities as far as input structures are concerned and the kinds of products produced or supplied in the economy. A variety of factor accounts may be formed to capture differences in types of factors of production (capital, land and labour) or differences in skills attributes of workers (high skilled, semi-skilled, and so on). Household accounts may be formed by grouping together relatively homogenous households, with the resulting representative household groups reflecting the unique socio-economic stratification in the society.

Of particular importance in this study, which focuses on the employment and household linkages in the economy, are the transaction flows in the SAM that link productive activities to factors of production and households. The value added sub-matrix in the activities column account captures information about wages and employment levels (the product of which is the wage bill) across different types of industries. A wage-based labour market policy will impact on employment levels and/or wage levels, which will result in a change in factor incomes. A change in factor income will ultimately lead to a change in household income, with the relevant matrix here being the functional distribution matrix in the SAM. This matrix (household row and factor column) shows how factor incomes are distributed among household groups. Clearly, in terms of the distributional effects of labour market policies, the factor and household accounts are of critical importance.

This study uses a South African SAM with base-year 2000, which was compiled by the PROVIDE Project (PROVIDE, 2006). The version of the SAM used in this study includes 22 commodity accounts, 22 activities representing economic sectors, as well as a rich specification of households and factors. There are 88 labour groups, disaggregated by province, race and occupation type, as well as 162 representative household groups, disaggregated by province, race, and gender and education of the head of the household. Agricultural households and those living in former homelands are also identified where relevant. A full listing and description of how the household and factor groups were formed is included in section 3.2 of this appendix.

Appendix Table 2: A Macroeconomic Social Accounting Matrix Framework and Description of Transactions

Expenditures→ Receipts ↓	1. Commodities	2. Activities	3. Factors	4. Households	5. Enterprises	6. Government	7. Savings investment	8. Rest of the world (RoW)	TOTAL
1. Commodities		Intermediate inputs (USE matrix)		Private consumption	Enterprise consumption	Government consumption	Investment	Exports	Demand
2. Activities	Domestic production (MAKE matrix)								Activity income (gross output)
3. Factors		Value-added						Factor income from RoW	Factor income
4. Households			Factor income to households	Inter-household transfers	Transfers to households	Transfers to households		Transfers to households from RoW	Household income
5. Enterprises			Factor income to enterprises			Transfers to enterprises		Transfers to enterprises from RoW	Enterprise income
6. Government	Sales taxes, tariffs, export taxes	Indirect taxes, factor use taxes	Factor income to government, factor taxes	Transfers to government, direct household taxes	Transfers to government, direct enterprise taxes			Transfers to government from RoW	Government income
7. Savings- investment			(Capital Stock Depreciation)	Household savings	Enterprise savings	Government savings		Balance of payments (Current account deficit)	Total savings
8. Rest of the world (RoW)	Commodity Imports		Factor income to RoW						Foreign exchange outflow
TOTAL	Supply	Activity expenditures	Factor expenditures	Household expenditure	Enterprise expenditure	Government expenditure	Investment	Foreign exchange inflow	

2.1.2. CGE Model Basics

While the accounts of the SAM determine the agents that are included in the CGE model, and the transactions recorded in the SAM identify the transactions that took place, the CGE model itself is defined by behavioural relationships. These behavioural relationships are a mix of non-linear and linear relationships that govern how the economic agents in the model respond to exogenously determined changes in the model's parameters and/or variables.

The CGE model used here uses a Linear Expenditure System (LES) to model consumption demand. This is an extension of the familiar Cobb-Douglas demand system. The associated utility function is also known as the Stone-Geary utility function (Stone, 1954). The Stone-Geary function is calibrated by specifying commodity-specific income elasticities for each household group in the model. So-called Frisch parameters, i.e., substitution parameters that measure the sensitivity of the marginal utility of income to changes in income (Nganou, 2004), are also specified exogenously. Frisch parameters establish a direct relationship between the exogenously specified income elasticities and commodities' own price elasticities. One of the important limitations of the LES is the restriction on own price elasticities: these have to lie between -1 and 0, which implies inelastic demand for all goods and services. Also, cross-price elasticities are negative, which means all goods are defined as gross complements (De Boer and Missaglia, 2006).

Households choose their consumption bundles from a set of 'composite' commodities that are aggregates of domestically produced and imported commodities. These 'composite' commodities are formed as CES aggregates based on the so-called Armington assumption that domestically produced and imported commodities are imperfect substitutes (Armington, 1969). In this model the country is assumed to be a price taker for all imported commodities.

Domestic production uses a two-stage production process. A generalised version of this production structure was shown earlier in Figure 4.2. In terms of this formulation, final activity output (QX) is defined as a CES (or Leontief) function of 'value added' (QVA) and 'aggregate intermediate inputs' ($QINT$). The degree of substitutability (if any) at this level is determined by an elasticity of substitution parameter, σ_{QX} . At the second level value added is a CES function of primary factors of production (QF_1, QF_2, \dots, QF_n). In this instance the elasticity of substitution that determines the degree of substitutability between different factors is represented by σ_{QVA} . Intermediate inputs ($QINTD_1, QINTD_2, \dots, QINTD_n$) are further used in fixed proportions (Leontief function) to the level of $QINT$ (or to the level of QX if the top-level function is also a Leontief function). The production set-up further allows for activities to produce multiple products under the assumption that the proportionate combinations of commodity outputs produced by each activity/industry remain constant;

hence for any given vector of commodities demanded there is a unique vector of activity outputs that must be produced.

This employment structure is a key model aspect in the context of the labour market policies simulated in this study. The reason for this becomes clear when model results are explored; the degree of substitutability between different factors of production (σ_{QVA}) determines the employment and hence overall poverty results to a large extent.

The vector of commodities demanded in the economy is determined by the domestic demand for domestically produced commodities and export demand for domestically produced commodities. Using the assumption of imperfect transformation between domestic demand and export demand, in the form of a Constant Elasticity of Transformation (CET) function, the optimal distribution of domestically produced commodities between the domestic and export markets is determined by the relative prices on the alternative markets. The model can be specified as a small country, i.e., price-taker, on all export markets, or selected export commodities can be deemed to face downward sloping export demand functions, i.e., a large country assumption. The other behavioural relationships in the model are generally linear. For a detailed discussion of the model properties, see PROVIDE (2005).

2.1.3. *Closure Rules Adopted for this Study*

The model is set up with a range of flexible closure rules. Model closure rules are typically selected with the objective of providing a realistic representation of the economy under investigation. Mathematically speaking, closure rules ensure that the number of variables and equations in the model are consistent, a necessary condition for the model to solve. In economic terms closure rules define fundamental differences in perceptions of how economic systems operate, i.e. it assigns causality in terms of how equilibrium is achieved in the various macroeconomic balances. For this particular study the following closure rules are selected as the ‘basic closure’:⁹⁵

- The *foreign exchange market* is cleared under the assumption of a flexible exchange rate regime, in line with current practices of the South African Reserve Bank. The alternative closure (not selected here) is a fixed exchange rate and a flexible external balance.
- The *capital account*, which records all savings and investment related transactions, can be closed in a variety of ways, ultimately ensuring that investment equals savings

⁹⁵ In some instances alternative closures may be selected as part of the process of testing the sensitivity of model results. Any such deviations from the basic closure are explicitly mentioned.

in the economy. The investment level can be fixed, which implies that institutions (government, households and enterprises) generate enough savings to finance investments (investment-driven closure). This is typically achieved by allowing average savings rates of households and enterprises to vary. Alternatively, under a savings-driven closure the investment level is determined by the level of savings in the economy, with average savings rates of households and enterprises fixed. A further option, often regarded as a more balanced approach, is allowing the share of investment expenditure in total final domestic demand remains constant. This latter closure is selected in this study.

- The *government account* is either closed by variations in the level of government borrowing or savings, i.e. the size of the budget deficit or surplus. In terms of this closure all tax rates remain constant. This closure is appropriate when the policy shock considered has no significant impact on government revenue and/or requires no increase in government spending. Alternatively, tax rates can be allowed to vary in order to generate a level of government revenue sufficient to maintain the base-level budget deficit or surplus (balanced budget closure). Government expenditure can be fixed in real or nominal terms, or alternatively, in terms of a more balanced closure, it can be fixed relative to the level of domestic absorption (as with the savings-investment closure). Hence as the economy shrinks, government's expenditure levels also drop to compensate to some extent for the expected drop in revenues.
- The *factor market* closures selected were discussed in Chapter 4. To recap, *labour* is grouped into skilled workers and unskilled workers. An unemployment closure is selected for unskilled workers, i.e. there is an infinite supply of unskilled workers at fixed wages. In contrast, skilled wages adjust to ensure full employment. Under a short run closure *capital* stock is assumed to be immobile (or activity-specific), while under a long run closure capital stock is mobile, with capital being attracted to those sectors where the return to capital is the highest. The factor *land* is only employed in the agricultural sector. Land is assumed to be fully employed and immobile, i.e. it is only employed in the agricultural sector.

All prices in a CGE model are expressed relative to the *numéraire*, a fixed price (or price index) in the model, usually the consumer price index (CPI). This ensures that all the value results are expressed in real terms.

2.2. Micro-Simulation Models

The multinomial logit model is used in the estimation of employment and unemployment probabilities for labour market participants. As explained, the dependent variable is a discrete variable with 23 outcomes, namely employment in any one of 22 sectors and unemployment. The independent variables include the following dummy and spline variables:

- Age group: Ages 15 to 24, 25 to 34, 35 to 44 and 45 to 54, with 55 and up the referent group
- Race group: African, Coloured and Asian, with White the referent group
- Gender: female, with male the referent group
- Location: Urban areas are divided into metropolitan and non-metropolitan areas. Officially, there are five metropolitan areas in South Africa, including those in the Western Cape, Eastern Cape, Free State and Kwa-Zulu Natal, with Gauteng metropolitan areas selected as the referent group (see Pauw, 2005b). Other urban areas (or non-metropolitan areas) are grouped together as a single dummy variable, while two dummies for rural areas exist, i.e. those that fall under the former homelands and 'other' rural areas. The latter primarily includes commercial farmland.
- Education splines: Splines include no education up to grade 7, grades 8 to 11, grade 12, matric with diploma and matric with degree. The first spline is the referent group.

The model output appears below in Appendix Table 3.

Appendix Table 3: Multinomial Logit Model for Low-Skilled Workers and Unemployed Individuals

	aagric		aforest		afish		amine		afood		abevs		atext		alwpap	
age15_24	-2.37	[20.67] **	-1.90	[5.4] **	-4.61	[4.01] **	-2.54	[10.62] **	-2.21	[8.14] **	-3.40	[6.53] **	-2.97	[13.94] **	-2.41	[7.88] **
age25_34	-1.66	[15.38] **	-0.78	[2.59] **	-0.79	[1.14]	-0.59	[3.02] **	-1.11	[4.56] **	-1.67	[4.31] **	-1.71	[9.03] **	-1.26	[4.83] **
age35_44	-1.26	[11.62] **	-0.30	[1.01]	-0.93	[1.41]	0.51	[2.68] **	-0.47	[1.93]	-0.76	[2.06] *	-0.80	[4.41] **	-0.66	[2.55] *
age45_54	-0.74	[6.51] **	-0.38	[1.18]	-1.70	[2.09] *	0.56	[2.81] **	0.04	[0.17]	-0.27	[0.69]	-0.43	[2.3] *	-0.51	[1.85]
African	-2.11	[13.11] **	0.22	[0.21]	16.46	.	-1.32	[7.45] **	-0.21	[0.54]	1.09	[1.71]	0.20	[0.68]	-0.47	[1.34]
Coloured	-0.41	[2.47] *	-0.30	[0.27]	20.49	[40.01] **	-2.17	[8.28] **	0.54	[1.39]	1.99	[2.96] **	1.32	[4.21] **	0.58	[1.57]
Asian	-3.18	[4.75] **	-32.05	[30.4] **	-15.07	[30.62] **	-5.42	[5.31] **	0.66	[1.48]	-34.14	[55.5] **	2.03	[5.94] **	1.43	[3.39] **
female	-0.90	[15.49] **	-0.75	[4.43] **	-2.45	[4.46] **	-4.14	[19.03] **	-0.94	[8.19] **	-1.03	[5.21] **	0.82	[8.62] **	-1.50	[9.79] **
wcmetro	0.70	[2.29] *	23.63	.	23.48	[22.2] **	0.47	[0.76]	0.58	[2.31] *	0.53	[1.26]	1.73	[10.21] **	0.95	[3.85] **
ecmetro	1.13	[3.16] **	-9.11	[13.2] **	22.22	[15.47] **	-31.47	[152.79] **	-0.61	[1.74]	0.04	[0.09]	0.25	[1.08]	-1.14	[2.89] **
fsmetro	2.14	[5.9] **	-8.98	[13.18] **	-5.94	[5.45] **	-0.92	[0.89]	-0.33	[0.6]	0.50	[0.89]	1.55	[6.28] **	0.07	[0.16]
kzmetro	0.91	[2.19] *	-8.92	[13.19] **	-5.86	[5.43] **	-31.20	[146.31] **	0.33	[1.18]	0.29	[0.56]	0.78	[3.15] **	0.19	[0.62]
othurban	1.65	[6.23] **	23.04	[29.2] **	24.14	[23.21] **	2.49	[12.49] **	0.18	[1.12]	0.24	[0.81]	0.72	[4.89] **	-0.37	[1.87]
rural_hl	2.56	[9.81] **	24.23	[34.93] **	23.35	[18.01] **	0.26	[1.09]	-0.41	[2.05] *	-0.44	[1.42]	0.21	[1.28]	-0.97	[4.08] **
othrural	4.27	[16.56] **	26.31	[38.7] **	21.45	.	3.57	[17.68] **	0.20	[0.98]	-1.38	[2.96] **	0.16	[0.77]	0.43	[2.15] *
gr8_gr11	-0.37	[12.54] **	-0.44	[4.64] **	-0.43	[2.17] *	-0.03	[1.15]	0.12	[2.89] **	0.18	[2.23] *	0.17	[5.37] **	0.08	[1.7]
gr12	0.10	[0.75]	-0.01	[0.02]	-22.77	.	-0.19	[1.38]	-0.35	[1.98] *	-0.50	[1.49]	-0.37	[2.83] **	-0.13	[0.61]
diploma	0.09	[0.35]	-21.72	.	-1.16	.	0.31	[1.33]	-0.24	[0.51]	0.16	[0.29]	-0.28	[0.97]	-0.08	[0.19]
degree	0.57	[3.64] **	11.26	[20.2] **	12.82	[21.08] **	-0.10	[0.47]	0.51	[1.8]	0.38	[1.03]	-0.34	[1.34]	0.43	[1.55]
_cons	-0.39	[1.35]	-27.52	[22.48] **	-44.73	[35.26] **	-2.03	[6.79] **	-2.16	[4.74] **	-4.15	[6.18] **	-3.23	[9.51] **	-1.70	[4.28] **

...Appendix Table 3 continued...

	apetro		afert		apharm		anonmet		ametals		amach		autil		aconst	
age15_24	-2.88	[2.99] **	-2.58	[4.15] **	-2.73	[2.67] **	-1.91	[6.23] **	-2.47	[8.57] **	-2.58	[8.8] **	-3.00	[5.61] **	-2.16	[13.85] **
age25_34	-1.03	[1.1]	-2.15	[3.48] **	-3.77	[4.08] **	-0.72	[2.55] *	-1.47	[5.96] **	-1.30	[5] **	-1.44	[3.43] **	-1.22	[8.52] **
age35_44	-0.38	[0.44]	-0.76	[1.28]	-1.35	[2.06] *	-0.25	[0.91]	-0.43	[1.88]	-0.52	[1.99] *	-0.19	[0.48]	-0.53	[3.75] **
age45_54	0.42	[0.5]	-0.31	[0.51]	-0.51	[0.58]	0.11	[0.37]	-0.12	[0.5]	-0.17	[0.62]	0.37	[0.91]	-0.22	[1.52]
African	-1.20	[1.65]	18.66	[31.67] **	-0.93	[1.38]	-0.06	[0.17]	-0.86	[3.28] **	-1.07	[4.2] **	-1.01	[2.38] *	-1.09	[5.77] **
Coloured	-0.21	[0.22]	20.02	[31.41] **	-0.29	[0.32]	0.53	[1.28]	-0.16	[0.52]	0.16	[0.58]	-0.54	[1.06]	-0.32	[1.56]
Asian	-0.53	[0.68]	-15.89	[26.42] **	-28.59	[42.96] **	-35.03	[88.37] **	-0.52	[1.29]	0.27	[0.81]	-1.66	[1.55]	-0.88	[2.87] **
female	-2.91	[5.02] **	-0.99	[3.82] **	-2.64	[3.44] **	-1.19	[8.2] **	-3.06	[14.4] **	-1.34	[10.77] **	-1.80	[6.95] **	-3.08	[24.55] **
wcmetro	0.86	[0.7]	-0.60	[1.38]	-0.83	[0.81]	0.89	[3.82] **	-0.20	[0.81]	-0.26	[1.18]	0.98	[1.81]	0.76	[4.95] **
ecmetro	-31.66	[39.81] **	-0.65	[1.28]	-0.79	[0.7]	0.45	[1.68]	-1.96	[4.24] **	0.41	[2.23] *	-0.64	[0.81]	-0.38	[2.01] *
fsmetro	-30.69	[40.59] **	-0.86	[0.84]	-27.80	[49.25] **	-0.74	[0.91]	-2.46	[2.42] *	-0.36	[0.93]	-32.71	[86.09] **	0.01	[0.03]
kzmetro	0.61	[0.49]	-34.32	[153.62] **	-0.31	[0.27]	0.02	[0.06]	-0.71	[2.12] *	-0.83	[2.46] *	1.40	[2.36] *	-0.23	[1.08]
othurban	1.30	[1.74]	-0.99	[3] **	-0.68	[1.26]	0.01	[0.03]	-0.41	[2.89] **	-0.60	[4.04] **	0.91	[2.3] *	-0.13	[1.24]
rural_hl	-0.83	[0.83]	-2.33	[4.54] **	-1.41	[1.84]	-0.84	[3.8] **	-1.78	[8.57] **	-1.28	[7.2] **	0.69	[1.6]	-0.08	[0.82]
othrural	0.93	[0.85]	-1.34	[2.43] *	-28.04	[77.2] **	-0.66	[2.27] *	-1.23	[5.37] **	-2.67	[6.62] **	1.09	[2.5] *	-0.36	[2.79] **
gr8_gr11	0.31	[1.61]	0.22	[1.8]	0.55	[2.31] *	-0.05	[0.86]	-0.01	[0.12]	0.08	[1.75]	-0.13	[1.29]	-0.15	[5.03] **
gr12	0.69	[1.06]	0.50	[1.25]	0.16	[0.22]	-0.02	[0.1]	0.32	[1.81]	-0.06	[0.37]	1.32	[3.69] **	-0.14	[1.06]
diploma	1.13	[2.1] *	-0.65	[0.88]	1.92	[2.9] **	-0.36	[0.7]	-0.32	[0.8]	-0.11	[0.3]	0.16	[0.33]	0.04	[0.14]
degree	0.10	[0.24]	0.63	[1.43]	-15.34	[60.07] **	0.21	[0.58]	0.34	[1.25]	0.08	[0.28]	0.13	[0.35]	0.20	[1.04]
_cons	-5.28	[4.79] **	-21.93	.	-3.99	[3.74] **	-2.38	[5.56] **	-0.28	[0.89]	-0.53	[1.56]	-3.00	[4.73] **	0.83	[3.64] **

...Appendix Table 3 continued...

	atrad		aacom		atrans		afinbus		asocial		adomes	
age15_24	-2.32	[21.57] **	-2.22	[10.33] **	-3.04	[14.51] **	-2.61	[12.89] **	-4.04	[36.02] **	-2.65	[23.12] **
age25_34	-1.37	[13.67] **	-1.38	[7.05] **	-1.67	[9.9] **	-1.58	[8.56] **	-2.96	[32.3] **	-1.74	[17.53] **
age35_44	-0.76	[7.66] **	-0.68	[3.46] **	-0.81	[4.79] **	-1.02	[5.45] **	-2.05	[23.17] **	-1.03	[10.7] **
age45_54	-0.48	[4.58] **	-0.55	[2.68] **	-0.26	[1.53]	-0.50	[2.44] *	-1.61	[16.76] **	-0.55	[5.46] **
African	-0.40	[2.71] **	2.12	[2.11] *	-0.28	[1.27]	0.50	[1.81]	-0.48	[3.32] **	2.14	[3.51] **
Coloured	0.31	[1.94]	2.50	[2.48] *	0.27	[1.07]	1.48	[5.08] **	0.50	[3.17] **	2.32	[3.79] **
Asian	0.36	[1.79]	1.74	[1.58]	-0.54	[1.48]	-0.91	[1.72]	-0.59	[2.57] **	0.20	[0.24]
female	-0.37	[8.87] **	0.26	[2.9] **	-2.57	[20.29] **	-0.86	[10.56] **	-0.38	[8.27] **	1.28	[21.33] **
wcmetro	0.30	[2.95] **	0.28	[1.41]	0.46	[2.67] **	0.08	[0.52]	0.51	[4.52] **	0.28	[2.25] *
ecmetro	-0.51	[4.33] **	-0.76	[2.78] **	-0.50	[2.41] *	-0.61	[3.2] **	-0.08	[0.63]	-0.09	[0.73]
fsmetro	-0.41	[2.3] *	0.16	[0.59]	0.23	[0.81]	-0.06	[0.25]	0.98	[6.7] **	-0.06	[0.37]
kzmetro	-0.08	[0.55]	-0.12	[0.44]	0.10	[0.37]	-0.03	[0.15]	0.17	[1.01]	0.18	[1.28]
othurban	-0.11	[1.77]	-0.39	[3.22] **	-0.22	[1.98] *	-0.67	[6.48] **	0.27	[3.84] **	-0.08	[1.13]
rural_hl	-0.39	[5.86] **	-0.90	[6.75] **	-0.94	[6.97] **	-1.68	[11.35] **	-0.42	[5.32] **	-1.10	[13.05] **
othrural	-0.59	[6.62] **	-0.20	[1.27]	-0.65	[3.93] **	-1.28	[7.51] **	0.06	[0.62]	0.06	[0.67]
gr8_gr11	0.08	[4.46] **	0.04	[1.2]	0.13	[4.11] **	0.22	[6.13] **	0.12	[6] **	-0.23	[10.49] **
gr12	0.04	[0.61]	0.03	[0.24]	-0.09	[0.73]	0.61	[5.2] **	0.35	[4.47] **	-0.41	[3.49] **
diploma	-0.09	[0.64]	-0.39	[1.21]	-0.03	[0.11]	0.42	[2.39] *	0.91	[9.2] **	-1.69	[3.55] **
degree	0.03	[0.27]	-0.33	[1.14]	0.24	[1.37]	-0.08	[0.56]	-0.01	[0.06]	1.32	[5.16] **
_cons	0.40	[2.37] *	-3.80	[3.78] **	-0.37	[1.54]	-1.60	[4.97] **	1.09	[6.42] **	-2.56	[4.16] **

- Notes: (1) Absolute values of z-statistics in square brackets.
(2) * Significant at 5 per cent; ** Significant at 1 per cent.
(3) Number of observations: 37 204.
(4) Pseudo R²: 0.1555.
(5) Base outcome: 'unemployed'.

Source: IES/LFS 2000 and author's own estimations

The earnings function is a simple regression on wages earned. As noted briefly in the main text, the equation includes the same set of independent variables as the multinomial logit model above, except for the addition of sector dummy variables. Since this equation is estimated for all low-skilled (employed) and unemployed persons, there are 23 dummy variables. The dummy for 'unemployment' is selected as referent case, which means that the estimated coefficient associated with each of the remaining sector dummies in the equation (see left-hand column of Appendix Table 4) shows the amount by which an unemployed person's estimated wage must be increased once that person is selected for employment in a growing sector. The fact that all coefficients are positive and significantly different from zero (unemployed persons report a wage of zero in the survey data) attests to the reliability of this model in predicting earnings of individuals that move from unemployment to employment.

Appendix Table 4: Earnings Function Low-Skilled Workers and Unemployed Individuals

aagric	12,322.74	[16.2] **	...continued...		
aforest	12,032.80	[20.01] **	age15_24	-2,805.65	[3.28] **
afish	14,024.54	[7.23] **	age25_34	-541.79	[0.62]
amine	29,070.89	[24.82] **	age35_44	3,372.60	[3.88] **
afood	17,747.30	[17.13] **	age45_54	3,304.60	[3.81] **
abevs	18,188.45	[11.32] **	African	-25,533.35	[11.79] **
atext	14,680.27	[23.72] **	Coloured	-20,900.79	[9.31] **
alwpap	18,614.37	[14.38] **	Asian	-15,358.66	[5.68] **
apetro	54,871.88	[5.24] **	female	-3,634.07	[11.43] **
afert	21,445.55	[10.36] **	wcmetro	2,171.30	[2.25] *
apharm	16,079.97	[2.38] *	ecmetro	-192.32	[0.23]
anonmet	18,732.32	[19.83] **	fsmetro	-595.55	[0.55]
ametals	22,366.21	[16.51] **	kzmetro	-1,308.29	[1.33]
amach	22,946.38	[13.67] **	othurban	-658.61	[1.08]
autil	28,877.18	[11.56] **	rural_hl	-1,400.80	[2.94] **
aconst	17,275.45	[17.04] **	othrural	-1,411.91	[2.48] *
atrad	15,015.75	[31.21] **	gr8_gr11	1,079.36	[12.07] **
aaccom	14,059.52	[18.4] **	gr12	3,163.14	[6.92] **
atrans	23,912.74	[23.75] **	diploma	16,342.54	[4.85] **
afinbus	25,665.14	[7.4] **	degree	-321.55	[0.14]
asocial	19,642.27	[25.27] **	_cons	23,705.13	[10.29] **
adomes	8,544.85	[35.71] **			

- Notes:
- (1) Absolute values of z-statistics in square brackets.
 - (2) * Significant at 5 per cent; ** Significant at 1 per cent.
 - (3) Number of observations: 37 204.
 - (4) R^2 : 0.2039.

Source: IES/LFS 2000 and author's own estimations

3. Data and Data Sources

3.1. Micro-Level Data: Income and Expenditure and Labour Force Surveys

There are various sources of demographic and income/expenditure data available in South Africa. Statistics South Africa conducts a variety of regular surveys. Most suited to the micro-level analyses in this particular study is the Income and Expenditure Survey (IES) of 2000 (IES 2000) (SSA, 2002b) as well as the LFS September 2000 (LFS 2000:2) (SSA, 2002c). These two surveys are merged to form a comprehensive database that links detailed labour market information at the person-level with household-level information about income (including non-wage income sources) and expenditure. The household-level information is particularly important as it allows for a better evaluation of the poverty status of households and individuals within households.

The use of the IES/LFS 2000 may seem surprising for at least two reasons. Firstly, several researchers have raised concerns about the reliability of the IES/LFS 2000 datasets, whether merged or used separately, as well as the comparability of these with other datasets. The IES 2000 dataset, for example, is fraught with data problems. Most of the problems relate to sloppiness in data collection, accounting and coding of variables. There are also numerous records that are problematic due to missing values for some of the variables, while an alarmingly large number of household report zero expenditure on food. Reporting on, for example, tax payments is also far below the expected level when compared to actual tax collection data.

A detailed account of the problems is included in a technical report by Pauw (2005a) (also see Burger and Burger, 2003, Poswell, 2003, Simkins, 2003). This report also outlines, in detail, the steps followed to remove errors and inconsistencies from the dataset.⁹⁶ This includes recalculation of income and expenditure totals and sub-totals and estimation of missing values. Numerous consistency checks of income and expenditure estimates within observations (households) were also performed. Care was taken not to compromise the reliability of income and expenditure estimates, although at the aggregate level income and expenditure estimates, and hence also poverty and, to a lesser extent, inequality estimates, were affected. In a comparative static modelling context where the interest is in changes in poverty and inequality, the actual level of poverty and inequality in the base is arguably of lesser importance than the modelling process that generates the predicted change.

⁹⁶ The data cleaning process was part of the data preparation work for the compilation of the PROVIDE SAM used in this study (see below).

The second reason why the use of the IES/LFS 2000 might be criticised relates to the fact that this data is by now fairly dated. Statistics South Africa has already released the Labour Force Survey of March 2007, which means much more recent wage and employment are available. The IES 2005/06 was also recently released (March 2008). Unfortunately, though, this newest edition of the IES cannot be merged with the LFS (or October Household Survey) of the same period as was possible with its predecessors, the IES 2000 and 1995. Merging is important in the context here given the interest in linking labour market participants and households directly in order to accurately capture poverty and distributional effects associated with labour market policies. The fact that the IES/LFS 2000 also forms the basis of the household and factor-related accounts and sub-matrices in the SAM is a further motivating factor for using this dataset, as it facilitates the integration or sequential linking of the CGE results with the micro-level models used in this study.

A final reason for the use of the IES/LFS 2000 data in the minimum wage scenarios in particular relates to the fact that minimum wages were first introduced in 2002 in South Africa, while others followed in the three to four years thereafter. The aim of the minimum wage scenarios is to simulate their impact on employment and poverty, and hence the 'base case' has to be the situation prior to the introduction of minimum wages.

3.2. The Household and Factor Groups in the South African SAM

The household accounts of the PROVIDE SAM used here were formed using indicators or location (province and former homelands), population group, informal agricultural activities, gender of the head of the household, education levels of the household head and the per capita income levels of the households. The IES/LFS 2000 was used as a source of individual/household demographic information and income levels for the formation of the household groups. Being a survey with limited numbers of observations, the population cannot be disaggregated fully in each dimension. Hence, the extent to which sub-groups could be further disaggregated was determined to a large extent by the sample sizes within those sub-groups. When fewer and fewer sample observations are included in a representative group, the confidence intervals around estimates of incomes and expenditures become very large, something that is best avoided.

At the first level of disaggregation households are grouped by province, reflecting the fact that welfare levels vary significantly across the provinces of South Africa.⁹⁷ For example, households in the more industrialised Western Cape and Gauteng are much better off than households in the Eastern Cape and KwaZulu-Natal. Large parts of the latter two provinces formed part of former homelands, and are still impoverished today. The next level of

⁹⁷ A further motivation is the strong regional focus of research conducted as part of the PROVIDE Project.

disaggregation is by racial group. Depending on the population numbers households within provinces were disaggregated into African, White, Coloured and/or Asian households.⁹⁸ African households living in KwaZulu-Natal and the Eastern Cape were also split into former homelands and 'non-homelands'. The racial groupings and homeland/non-homeland distinctions are justified by historical events which still today explain much of the inequalities that exist between racial groups as well as the high level of poverty among people living in the former homelands (see discussions in Chapter 2).

In addition to distinguishing African households involved in subsistence agriculture in some provinces⁹⁹, a gender dimension is also introduced in the SAM. In those province-race sub-groups where population numbers permitted, households were split into female- and male-headed households. It is especially among many of the African households where the high incidence of female-headed is evident. This is also a direct consequence of past policies which forced women to live in rural areas (often in the homelands) while their husbands were provided with 'passes' to work in the mines or industries in the cities. These migrant labour policies eventually contributed to creation of many fractured families, with women eventually becoming main breadwinners and heads of their households.

Again where population numbers permitted, educational attainment of the head of the household was used as a further dimension in the SAM. The main education levels included were (1) none or pre-primary, (2) primary schooling (up to Grade 7), lower secondary (Grades 8 through 10), upper secondary (Grades 11 and 12) and tertiary (any post-matric qualification or diploma). Education levels capture an important skills dimension and hence improve the relationship between factor and household accounts. There is also a strong link between education levels and unemployment and/or the poverty status of individuals.¹⁰⁰

A final level of disaggregation is income. As explained, although it is convenient to be able to report results for different household income groups, income is not an ideal way to define groups that are affected similarly by policies. The income dimension is therefore used here only to reduce the size of certain household sub-groups, i.e. only the very large groups were split around the groups' median income into low-income and high-income groups. A total of 162 household groups were formed, which are believed to accurately reflect the socio-economic structure of South Africa. A detailed description of the household groups as well as

⁹⁸ Given the small number of Asian or Indian households outside of KwaZulu-Natal and Gauteng, they were grouped with Coloured households in the other provinces.

⁹⁹ This group is less relevant in the current study, and was motivated by the fact that the SAM was principally designed with analyses involving the agricultural sector in mind.

¹⁰⁰ Although the education level of only the head of the household is used here, it is also evident that the household head is often the breadwinner in the household; hence the household's welfare level is closely linked to the educational attainment of the household head.

summary statistics (mean incomes and distributional statistics) is included in Pauw (2005b).¹⁰¹

The IES/LFS 2000 was also used as a source of information for the formation of the labour groups. As noted earlier, the link between household and factor groups in the SAM is important in the context of this study, as this forms the prime source of information about how additional income earned by factors of production are likely to be distributed across household groups. Income from labour is furthermore an important income source for many household groups. For this reason it is almost equally important to carefully consider the disaggregation of the factor account, although this is an area that is often neglected. The PROVIDE SAM includes capital, land and labour as the three main types of factors of production. Labour factors are further disaggregated, first by province and race. The resulting sub-groups are then disaggregated along skills and/or occupation groups, which provides an important link with the education attribute in the corresponding household groups. As with the household groups, the number of observations often determined the level of disaggregation. Where observation numbers within sub-groups were deemed insufficient, skills groups were formed (high-skilled, skilled, semi-skilled and unskilled) by grouping occupation types with similar skills profiles. A total of 88 labour groups are included in the SAM.

A detailed description of these labour groups and various summary statistics (mean wages and distributional statistics) are included in Pauw (2005b). Given the inconsistency between macro-data used in the construction of the macro-SAM (including data on value-added in the National Accounts) and the micro-data used to populate the macro-SAM, it is necessary to either free up wages or employment levels in order to allow the SAM to be balanced. The choice here was to preserve employment numbers, but this came at the expense of freeing up wages (PROVIDE, 2006). The average wages in the SAM therefore differ – sometimes substantially – from those in the survey data. No attempt was made to reconcile the survey

¹⁰¹ In earlier research Pauw (2003) considers the use of cluster analysis to identify ‘true groups’ among households using a completely numerical technique rather than . Cluster analysis attempts to solve the problem of devising a classification scheme for grouping the objects (households) into any number of classes given the characteristic variables of the households (Everitt, 1974). It is based on the notion of multivariate ‘distances’ between two single observations or samples of observations. The distance measures used are therefore used as measures of similarity or dissimilarity between observations. When forming representative household groups the aim is to group households that are likely to be affected similarly by policy shocks. One option, therefore, is to form any number of cluster groups based on households’ income shares from various sources and expenditure profiles. From the work by Pauw (2003) it can be concluded that clustering techniques are potentially useful for describing data and finding true or natural household groups, but the randomness of the iterative clustering process makes replication difficult. Household groups formed in this manner are also not easily recognisable for policy purposes, nor are they based on comparatively stable characteristics that are reliable and easily measured (see Decaluwé et al., 1999). Hence, from a practical point of view, cluster analysis may not be a preferable method of forming household groups.

data as this would influence poverty results (also see section 1.2 in this Appendix). As argued in Chapter 4, this is also not necessary when the link between the macro and micro models uses *percentage* changes as opposed to absolute changes in wages or prices.

In summary, it is clear that the PROVIDE SAM used here contains very rich detail about factors and households, and importantly, the interplay between these two sets of accounts as represented in the functional distribution matrix. Of course, no disaggregation structure is perfect, as you will inevitably still have households or factors that are dissimilar but grouped together, mainly due to data constraints.

3.3. CGE Model Calibration: Setting Sectoral Elasticities of Substitution

The simulations in Chapter 5 and Chapter 6 are set up to produce results for a range of ‘national weighted wage elasticities’ ranging from (in absolute terms) $\eta = 0.3$ (highly inelastic employment response) to $\eta = 2$ (highly elastic employment response). An elasticity of $\eta = 0.7$ is considered the benchmark elasticity. In the CGE model used here factor substitution is governed by a CES function specified separately for each activity; hence calibration requires that an elasticity of substitution value is set for each activity separately. Since wage elasticities vary across sectors it is not appropriate to simply set all sectoral wage elasticity at the same level as is often done in CGE modelling.

Plausible sectoral wage elasticity values are estimated for this study through experimentation. The wage increase calculated for low-skilled workers in the minimum wage simulations is used as a departure point. As shown in Table 5.3, the national average low-skilled wage shock emanating from the minimum wage is 6.5 per cent. Given low-skilled employment of 8.65 million in the base, employment losses will total 382 100 if the national weighted average elasticity were $\eta = 0.7$ (assuming a simple partial equilibrium framework where $\% \Delta L = \eta_L \% \Delta w$; see Table 5.7). The next step is to estimate sectoral wage elasticities using a simple solver model that would yield an aggregate employment loss of 382 100 given the sectoral wage changes shown in Table 5.3. Plausible boundaries are first set for these elasticities, i.e. a relatively low elasticity value is assumed for mining, agriculture and domestic services ($\eta = 0.2$ to $\eta = 0.4$), all manufacturing sectors are assumed to have the same moderate elasticity ($\eta = 0.5$ to $\eta = 0.8$), while services sectors have a slightly higher elasticity value ($\eta = 0.6$ to $\eta = 0.9$). These boundaries are considered plausible based on the literature survey done in Chapter 3. A simple solver model and several rounds of experimentation then yielded partial or own-price wage elasticity values for each sector that are consistent with a national weighted elasticity of $\eta = 0.7$ (see shaded column in Appendix Table 5 below). By adjusting sectoral elasticities up or down pro rata, elasticities are also obtained that are consistent with national weighted elasticities of $\eta = 0.3$, $\eta = 0.5$, $\eta = 1$ and $\eta = 2$.

It may appear strange that the national average elasticity is higher than any of the individual sectoral elasticities. This relates of course to the ‘aggregation issue’ in wage elasticity estimation (see equation [3.5] in Chapter 3), and also to the fact that the ‘weighted average’ here corresponds precisely to the expected wage increases as per the minimum wage scenario. A different approach may yield different elasticities. For example, if all low-skilled wages across all sectors increased by the same percentage, the implicit national weighted average elasticity in the benchmark simulation would be only $\eta = 0.5$ (see last row in Appendix Table 5). Incidentally, a different set of sectoral elasticities, such as those used in the National Treasury model (see Go et al., 2009), would yield a similar employment effect to our model if wages increased by the same percentage across the board, but for the minimum wage simulation their results would suggest a greater employment loss (the implicit elasticity would then be $\eta = 0.90$; see column labelled (2) in Appendix Table 5).

The elasticities shown in column (1) in Appendix Table 5 are partial or own-price elasticities that can be used in a partial equilibrium labour market model. In particular, in this study, these elasticity values are used to generate the direct employment loss associated with minimum wages in the partial equilibrium model (see Table 5.7). The CGE model, however, requires that these partial wage elasticities are converted to elasticities of substitution. This is easily done by applying equation [3.2]. In order to do this conversion, each factor’s share in total value added is required (τ), a parameter that can be calculated directly from the SAM (see column (3)).¹⁰² Column (4) shows the elasticity of substitution values that are equivalent to the partial elasticities in the benchmark simulation. The elasticities of substitution associated with the remainder of the simulations are all calculated in the same way. For comparative purposes we also show the elasticities of substitution in the National Treasury model.¹⁰³

The same elasticity values are maintained for the wage subsidy simulations. Of course, as explained above, since these simulations are based on a different set of wage changes than the minimum wage simulations, the implicit national average elasticity will no longer be $\eta = 0.3$, $\eta = 0.5$, and so on. For example, in reality in the simulation labelled $\eta = 0.7$ the partial equilibrium employment effect of the wage subsidy programme will actually yield an implicit elasticity value of $\eta = 0.51$ given an effective wage subsidy of 12.5 per cent for low-skilled workers and employment gains of about 500 000 (see Table 6.1 and Table 6.6). However, in order to avoid confusion, the ‘simulation names’ as they were used in the minimum wage scenarios are maintained.

¹⁰² The value added function assumes the same elasticity of substitution between each pair of factors of production. This means that it is unnecessary to calculate a separate value for τ for each factor of production, and hence the average share across all factors is used in the conversion here.

¹⁰³ A simple average elasticity value is shown in the table in instances where the National Treasury model reports elasticities at a more disaggregated sectoral level than our model.

Appendix Table 5: Sectoral Factor Substitution Elasticities for Value Added Production Function

	Sectoral elasticities (η_L) (*)					Implied sectoral elasticities in National Treasury model (η_L) (2)	Average factor share of value added (τ) (3)	Equivalent benchmark EOS value (σ_{QVA}) (**) (4)	Equivalent EOS value in National Treasury model (σ_{QVA}) (***) (5)
	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$				
Agriculture	0.15	0.24	0.34	0.49	0.97	0.57	0.07	0.36	0.58
Forestry	0.15	0.24	0.34	0.49	0.97	0.57	0.03	0.35	0.58
Fishing	0.15	0.24	0.34	0.49	0.97	0.57	0.09	0.37	0.58
Minerals and mining	0.09	0.14	0.20	0.29	0.57	0.19	0.06	0.21	0.19
Food products	0.21	0.36	0.50	0.71	1.43	0.57	0.09	0.55	0.58
Beverages and tobacco	0.21	0.36	0.50	0.71	1.43	0.38	0.05	0.53	0.38
Textiles	0.21	0.36	0.50	0.71	1.43	0.29	0.14	0.58	0.29
Leather Wood and Paper	0.21	0.36	0.50	0.71	1.43	0.43	0.10	0.55	0.43
Petroleum	0.21	0.36	0.50	0.71	1.43	0.42	0.04	0.52	0.42
Fertilisers and pesticides	0.21	0.36	0.50	0.71	1.43	0.58	0.03	0.52	0.58
Pharmaceuticals and other chemicals	0.21	0.36	0.50	0.71	1.43	0.47	0.06	0.53	0.47
Non metallics	0.21	0.36	0.50	0.71	1.43	0.58	0.09	0.55	0.59
Metals	0.21	0.36	0.50	0.71	1.43	0.41	0.07	0.55	0.41
Machinery equipment and other	0.21	0.36	0.50	0.71	1.43	0.41	0.07	0.54	0.41
Electricity and water	0.26	0.43	0.60	0.86	1.71	0.57	0.05	0.63	0.58
Construction and Building	0.26	0.43	0.60	0.86	1.71	0.57	0.12	0.68	0.58
Trade services	0.26	0.43	0.60	0.86	1.71	0.57	0.09	0.66	0.58
Accommodation	0.26	0.43	0.60	0.86	1.71	0.57	0.12	0.68	0.58
Transport and communication	0.26	0.43	0.60	0.86	1.71	0.57	0.07	0.65	0.58
Financial and business services	0.26	0.43	0.60	0.86	1.71	0.57	0.07	0.65	0.58
Government, social and other services	0.26	0.43	0.60	0.86	1.71	0.57	0.14	0.70	0.58
Domestic services	0.15	0.24	0.34	0.48	0.97	0.57	0.17	0.41	0.58
National average equivalent elasticity in minimum wage shock	$\eta = 0.30$	$\eta = 0.50$	$\eta = 0.70$	$\eta = 1.00$	$\eta = 2.00$	$\eta = 0.90$			
National average equivalent assuming same relative increase in wages in all sectors	$\eta = 0.21$	$\eta = 0.36$	$\eta = 0.50$	$\eta = 0.71$	$\eta = 1.42$	$\eta = 0.50$			

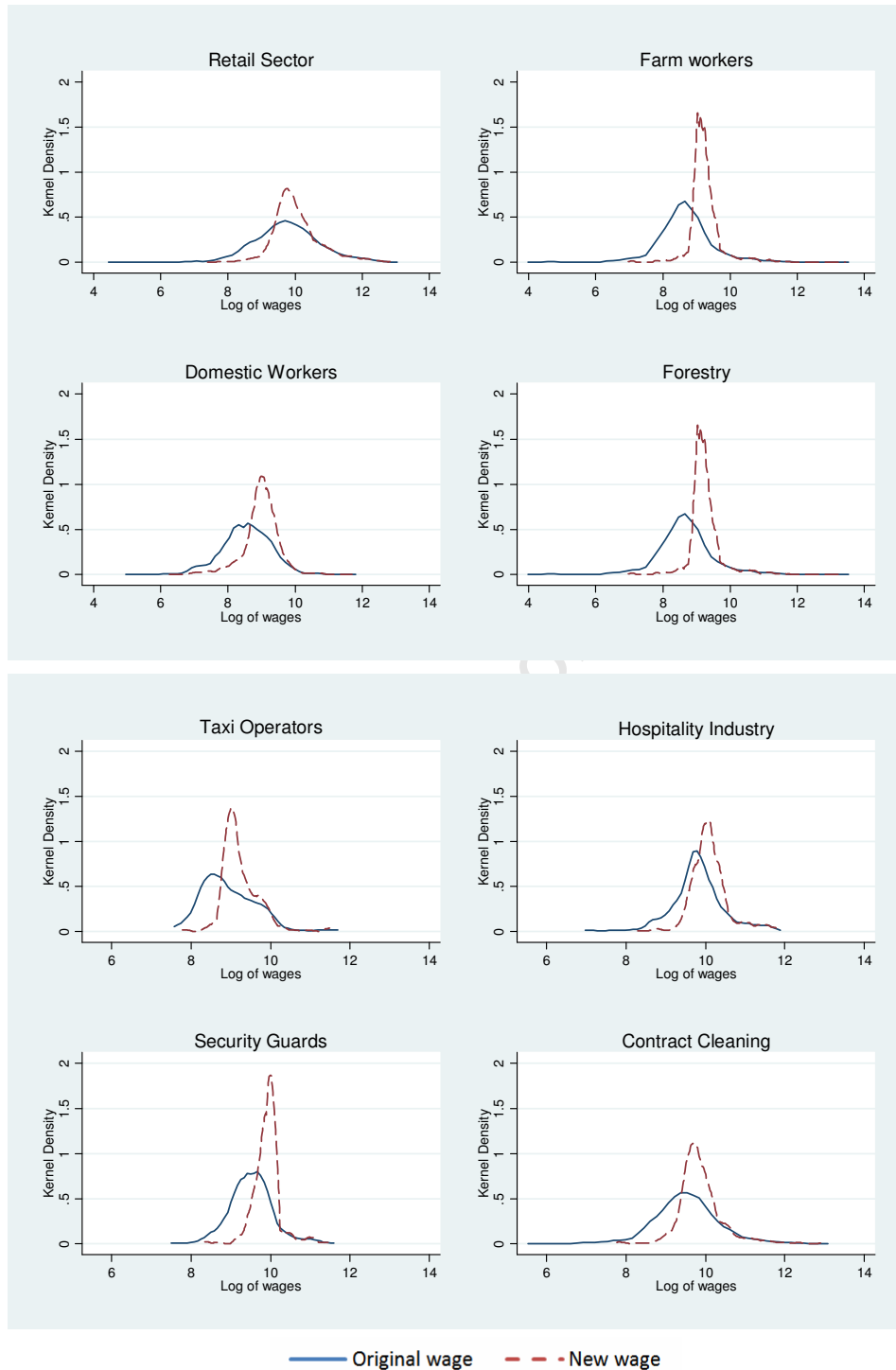
Notes: (*) As used in a partial equilibrium labour market model. (**) As used in the CGE model in this study. (***) See Go et al. (2009)

Source: Author's own calculations.

4. Additional Data, Model Results and Explanations

4.1. Minimum Wage Scenarios

Appendix Figure 2: Minimum Wages: Predicted Changes in Wage Distributions



Note: The wage distributions are for covered workers only and assumes no job loss, i.e. all sub-minimum wage workers simply move up to the minimum wage level without any risk of losing their income.

Source: IES/LFS 2000 and author's own calculations

Appendix Table 6: Baseline Poverty Estimates (Per Capita Income)

Annual poverty line	P_0			P_1			P_2		
	Estimate	95% conf. int.		Estimate	95% conf. int.		Estimate	95% conf. int.	
		Lwr.	Upp.		Lwr.	Upp.		Lwr.	Upp.
<i>R 1,000</i>	0.095	0.089	0.101	0.028	0.026	0.031	0.013	0.011	0.014
<i>R 1,250</i>	0.147	0.139	0.154	0.047	0.044	0.050	0.022	0.020	0.023
<i>R 1,500</i>	0.200	0.191	0.208	0.068	0.064	0.071	0.033	0.030	0.035
<i>R 1,750</i>	0.249	0.240	0.258	0.090	0.086	0.094	0.045	0.042	0.047
<i>R 2,000</i>	0.291	0.281	0.300	0.113	0.108	0.117	0.058	0.055	0.061
<i>R 2,250</i>	0.330	0.320	0.340	0.135	0.130	0.140	0.072	0.069	0.075
<i>R 2,500</i>	0.367	0.357	0.377	0.156	0.151	0.161	0.086	0.082	0.090
<i>R 2,750</i>	0.403	0.392	0.413	0.177	0.171	0.182	0.100	0.096	0.104
<i>R 3,000</i>	0.432	0.421	0.442	0.197	0.191	0.203	0.114	0.110	0.118
<i>R 3,250</i>	0.461	0.451	0.472	0.216	0.210	0.222	0.128	0.123	0.132
<i>R 3,500</i>	0.485	0.474	0.496	0.234	0.228	0.241	0.141	0.136	0.146
<i>R 3,750</i>	0.506	0.495	0.517	0.252	0.245	0.258	0.154	0.149	0.159
<i>R 4,000</i>	0.527	0.516	0.538	0.268	0.262	0.275	0.167	0.162	0.172

Source: IES/LFS 2000 and author's own calculations

Appendix Table 7: Employment Results: Short Run Scenario With Labour Productivity Gains

		25% lab. prod. ($\eta = 0.7$)	50% lab. prod. ($\eta = 0.7$)	75% lab. prod. ($\eta = 0.7$)	100% lab. prod. ($\eta = 0.7$)	125% lab. prod. ($\eta = 0.7$)
Low-skilled employment	$\eta = 0.7$					
Agriculture	-46,902	-42,319	-38,942	-36,264	-34,047	-32,158
Forestry	-1,223	-1,029	-866	-725	-601	-488
Retail and wholesale trade	-54,842	-45,270	-37,218	-30,169	-23,860	-18,130
Accommodation	-19,597	-15,125	-11,301	-7,909	-4,843	-2,036
Transport and communication	-4,254	-2,723	-1,457	-361	611	1,489
Financial and business services	-5,419	-2,985	-1,010	676	2,157	3,484
Government, social and other services	-13,031	-4,697	2,073	7,860	12,950	17,514
Domestic services	-291,328	-279,036	-269,036	-260,476	-252,938	-246,174
Other Sectors	-12,395	-3,371	3,940	10,169	15,626	20,497
Net change	-448,991	-396,555	-353,818	-317,199	-284,943	-256,002
<i>Percentage change in overall low-skilled employment</i>	-5.2%	-4.6%	-4.1%	-3.7%	-3.3%	-3.0%
<i>Change relative to benchmark</i>		-11.7%	-21.2%	-29.4%	-36.5%	-43.0%
Skilled employment						
Agriculture	-1,202	-1,147	-1,114	-1,093	-1,078	-1,069
Forestry	-16	-16	-17	-17	-17	-18
Retail and wholesale trade	-6,337	-6,236	-6,111	-5,978	-5,846	-5,715
Accommodation	-3,050	-2,458	-1,946	-1,489	-1,073	-692
Transport and communication	674	404	188	8	-149	-288
Financial and business services	1,434	1,485	1,503	1,503	1,494	1,479
Government, social and other services	5,718	5,685	5,621	5,545	5,466	5,387
Domestic services	-161	-156	-152	-148	-145	-142
Other Sectors	2,940	2,441	2,028	1,669	1,349	1,059
Net change	0	-0	-0	-0	0	0

Source: CGE/micro-model results

Appendix Table 8: Activity Output (Production Effects)

	Short run					Long run				
No labour productivity gains	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$	$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Agriculture	-0.0%	-0.3%	-0.5%	-0.8%	-1.5%	-1.4%	-1.7%	-1.9%	-2.1%	-2.6%
Forestry	0.1%	-0.0%	-0.1%	-0.3%	-0.8%	-0.4%	-0.5%	-0.6%	-0.7%	-1.1%
Retail and wholesale trade	0.0%	-0.1%	-0.3%	-0.5%	-1.0%	-0.4%	-0.5%	-0.6%	-0.7%	-1.2%
Accommodation	-1.3%	-2.0%	-2.6%	-3.3%	-5.2%	-7.6%	-7.9%	-8.2%	-8.4%	-9.1%
Transport and communication	0.1%	0.0%	-0.0%	-0.1%	-0.5%	0.4%	0.3%	0.3%	0.1%	-0.4%
Financial and business services	-0.3%	-0.4%	-0.5%	-0.6%	-1.1%	-0.1%	-0.2%	-0.3%	-0.5%	-1.1%
Government, social and other services	-0.1%	-0.2%	-0.3%	-0.4%	-0.9%	0.0%	-0.1%	-0.2%	-0.3%	-0.9%
Domestic services	-23.9%	-24.0%	-24.1%	-24.2%	-24.5%	-24.4%	-24.4%	-24.4%	-24.5%	-24.8%
Other Sectors	-0.1%	-0.2%	-0.3%	-0.4%	-0.9%	-0.0%	-0.1%	-0.2%	-0.3%	-0.8%
Net change	-0.2%	-0.4%	-0.5%	-0.6%	-1.1%	-0.3%	-0.4%	-0.5%	-0.7%	-1.2%
	25% lab. prod. ($\eta = \text{prod.}$ 0.7)	50% lab. ($\eta = \text{prod.}$ 0.7)	75% lab. ($\eta = \text{prod.}$ 0.7)	100% lab. ($\eta = \text{prod.}$ 0.7)	125% lab. ($\eta = \text{prod.}$ 0.7)	25% lab. prod. ($\eta = \text{prod.}$ 0.7)	50% lab. ($\eta = \text{prod.}$ 0.7)	75% lab. ($\eta = \text{prod.}$ 0.7)	100% lab. ($\eta = \text{prod.}$ 0.7)	125% lab. ($\eta = \text{prod.}$ 0.7)
With labour productivity gains										
Agriculture	0.6%	1.4%	2.0%	2.6%	3.1%	-0.9%	-0.0%	0.7%	1.2%	1.7%
Forestry	0.3%	0.8%	1.2%	1.5%	1.9%	-0.1%	0.4%	0.8%	1.2%	1.5%
Retail and wholesale trade	0.2%	0.7%	1.1%	1.5%	1.9%	-0.1%	0.4%	0.9%	1.3%	1.7%
Accommodation	-0.4%	1.4%	3.0%	4.5%	5.9%	-5.2%	-2.6%	-0.2%	2.0%	4.2%
Transport and communication	0.3%	0.6%	0.8%	1.1%	1.3%	0.5%	0.8%	1.1%	1.3%	1.5%
Financial and business services	-0.0%	0.4%	0.7%	1.0%	1.3%	0.1%	0.5%	0.9%	1.2%	1.5%
Government, social and other services	0.1%	0.5%	0.8%	1.1%	1.4%	0.2%	0.6%	0.9%	1.2%	1.4%
Domestic services	-17.3%	-11.3%	-5.7%	-0.5%	4.4%	-17.7%	-11.7%	-6.1%	-0.9%	4.0%
Other Sectors	0.2%	0.6%	0.9%	1.3%	1.6%	0.2%	0.6%	1.0%	1.3%	1.6%
Net change	0.0%	0.5%	0.9%	1.3%	1.6%	0.0%	0.5%	0.9%	1.3%	1.6%

Source: CGE/micro-model results

4.2. Wage Subsidy Scenarios

4.2.1. *South Africa's Learnership Experience*

The South African learnership system could be considered a direct outcome of earlier proposals related to the subsidisation of employment (as discussed in Chapter 6). Learnerships can be classified as training-linked wage subsidies where subsidised employment is linked to both temporary employment and the provision of structured learning by the employer. In many respects learnerships are similar to apprenticeships; in fact, in some countries they are referred to as 'modern apprenticeships'. However, whereas standard apprenticeships focus on training and skills acquisition only, learnerships have a broader focus, aiming to also provide academically accredited learning. The intention is to strengthen the link between structured learning and workplace experience, thus ultimately providing a learner with a nationally recognised qualification (Smith et al., 2005).

Learnerships officially became part of South Africa's National Skills Development Strategy (NSDS) when the Tax Act (No. 58 of 1962) was amended in 2002 to allow for "*deductions in respect of learnership agreements*". This provision allowed firms to deduct a certain (fixed) part of the cost of offering formally registered learnerships from company taxes, the idea being that this would act as an incentive for firms to increase their intake of learners and ultimately increase employment levels. The learning component has to be offered by an accredited training provider (this may be the employer itself, subject to accreditation) while the qualifications obtained upon completion have to be nationally recognised.¹⁰⁴ Learnerships are primarily targeted at entry-level occupations and hence also implicitly at young labour market entrants, particularly school-leavers. In principle, though, the subsidy applies to any type of occupation or skill level for which a learnership is registered.

Pauw et al. (2006) investigated the role and impact of learnerships in promoting the absorption of the youth and graduates¹⁰⁵ into employment. The study finds that firms that participate in the learnership programme are generally very positive and enthusiastic about

¹⁰⁴ In South Africa learnerships are developed and registered by the various Sectoral Education and Training Authorities (SETAs) established in terms of the National Skills Development Act of 1998. All learnerships are graded in terms of the South African Qualifications Authority's (SAQA) National Qualifications Framework (NQF).

¹⁰⁵ Graduates in this instance were broadly defined as students with post-matric qualifications obtained from tertiary institutions, including universities, colleges and universities of technology. Their findings are based on around 20 interviews conducted with human resources practitioners in large corporations in South Africa, including several financial institutions (banking, accounting and insurance), construction firms, mining companies, wholesalers and retailers, and other manufacturing corporations. They warn that these findings may be 'large firm-specific', although, as discussed further below, uptake of learnerships mainly took place in these large firms and not so much in smaller firms excluded in the study.

the idea of the programme, but less positive about several aspects around administration, implementation and the effectiveness of the policy in promoting ‘above-equilibrium employment’. Pauw et al.’s (2006) main findings relating to learnership programmes are summarised here.¹⁰⁶

The first major concern of firms relates to the **high administrative costs** associated with learnerships. The administrative processes involved in setting up learnership programmes are complex, costly and time-consuming. The processes are also highly bureaucratic; for example, learnership programmes have to be developed along a very restrictive set of guidelines, programmes have to be registered and programme content has to be accredited in terms of unit standards. A common sentiment was that the SETAs that are meant to facilitate the processes are incompetent, while poor management and high staff turnover rates within the SETAs are slowing down the process of applying for accreditation.

The high costs have several implications. Some firms indicated that the red tape involved in setting up and registering learnerships is too cumbersome to make it a worthwhile exercise. Large corporations that can afford to employ dedicated persons to manage learnership programmes and maintain contact with the SETAs are more likely to participate. They also benefit from economies of scale, which reduces the fixed cost per learner. For smaller firms that may only wish to enroll a small number of learners, on the other hand, the start-up costs of learnership programmes are very often prohibitive. The administrative burden further acts as a major barrier to expansion of existing programmes. Most firms indicated that although they make use of the learnership system, they tend to link the learnership system to their recruitment and employment strategies with the intention of employing learners upon completion of the training. They therefore only employ learners that they would have employed in any event.

The above point brings us to a second major conclusion of the Pauw et al. (2006) study, namely the issue of whether the learnership programme is effective in reducing unemployment through the **generation of above-equilibrium employment**. In this regard it is worthwhile pointing out that firms may either enroll their existing workers in learnership programmes or they can recruit unemployed persons from outside the firm. In an attempt to promote the absorption of people from outside firms, learnership subsidy amounts are more generous for these ‘unemployed learners’. It is also therefore not surprising that unemployed learners make up the majority (about two-thirds) of registered learners (Smith et al., 2005). In fact, official figures show that the intake of learners exceeded initial targets: by March 2005

¹⁰⁶ The main findings of the research was also published as a journal article (see Pauw et al., 2008b), but the earlier working paper version referenced here contains more of the information on learnerships relevant to this study.

almost 110 000 learners were enrolled in programmes nationwide, well above the target of 80 000. However, when considering that only about 73 000 of these learners were recruited from outside the firm, it is clear that firms still tend to use the scheme as vehicle for providing training for their incumbent workers. Pauw et al. (2006) further find that even the intake of unemployed learners, i.e. external jobseekers, largely represent people who would have been hired by the firm anyway. When viewed within the context of a generally expanding labour market between 2002 and 2006, the employment-generating effects of the scheme no longer look so positive.

A third concern relates to the **incentive structures** of the learnership scheme. Learnerships are certainly perceived as being important in standardising and promoting learning in the workplace. However, many firms feel that the learning component or the accredited academic qualification attached to learnerships is not always appropriate from the firm's point of view, particularly those that operate in manufacturing, construction or mining-type environments. In this regard the decline of the apprenticeship system that focused more on practical work experience or vocational training in specific competency areas is lamented. Officially the apprenticeship system is still in place, but since BEE points¹⁰⁷ are only available to firms offering learnerships, there is an incentive to convert apprenticeship programmes to learnerships, even if the latter are less appropriate. Firms surveyed in the Pauw et al. (2006) study admitted that participation in the scheme was motivated to a large extent by the BEE charter, clearly suggesting that incentive structures are perverse. Others suggested that they saw participation as a corporate social responsibility rather than a business necessity. The consensus was that the actual subsidy that is on offer for participation plays only a small part in the decision whether to participate or not.

The evidence that firms typically only enrol learners that they would have employed in any event, coupled with the evidence above that the actual grants received in respect of learners are not the main incentive for participation in the learnership scheme, suggests that the 'wage subsidy' earned by firms could be seen as a windfall gain. The fact that one-third of registered learners are already employed at the time of registration further attests to this. The alternative view, however, and one that was pointed out by many respondents in the Pauw et al. (2006) study, is that the cost of compliance actually far exceeds the grant value. In theory,

¹⁰⁷ The Department of Trade and Industry (DTI) developed a (Broad-Based) Black Economic Empowerment (BEE) scorecard system, which South African firms use in order to demonstrate their commitment to transformation in ensuring that black people participate in the mainstream economy and enjoy the benefits thereof. BEE codes have been developed around three main strands, namely empowerment (ownership and management of firms), human resources development (employment equity and skills development) and indirect empowerment preferential procurement, enterprise development and socio-economic development). Up to 15 per cent of a firm's BEE score is made up by skills development in the form of learnerships and learning programmes offered (see www.dti.gov.za), and hence participation in learnership programmes becomes an imperative, especially for large corporations who are in the public eye.

the subsidy is meant to compensate employers for the lower productivity of learners relative to other workers (this is linked to the opportunity cost when the worker is away on training), the cost of learning materials and the costs associated with management time invested in implementing the programme and mentoring learners. In reality, however, only a portion of the actual wage is covered, and although these subsidies may seem generous¹⁰⁸ firms claim that the excessive administration costs that they have to incur are to blame for their failure to expand their intake.

While the implications of these findings for a pure wage subsidy scheme may seem dire, the overwhelming perception is that the disheartening aspect of the learnership system is not the fact that the employment subsidy component is necessarily ineffective, but rather that the administrative requirements around the learning component of the programme is the major stumbling block. Many firms indicated a willingness to expand enrolment of learners if the subsidy amount was truly sufficient to cover the administrative costs. Alternatively, they felt that participation may improve if the administrative burden was reduced. This suggests that a carefully designed pure wage subsidy programme may well be more effective at generating above-equilibrium employment than the learnership programme has been thus far.

4.2.2. Wage Subsidy Modelling Results

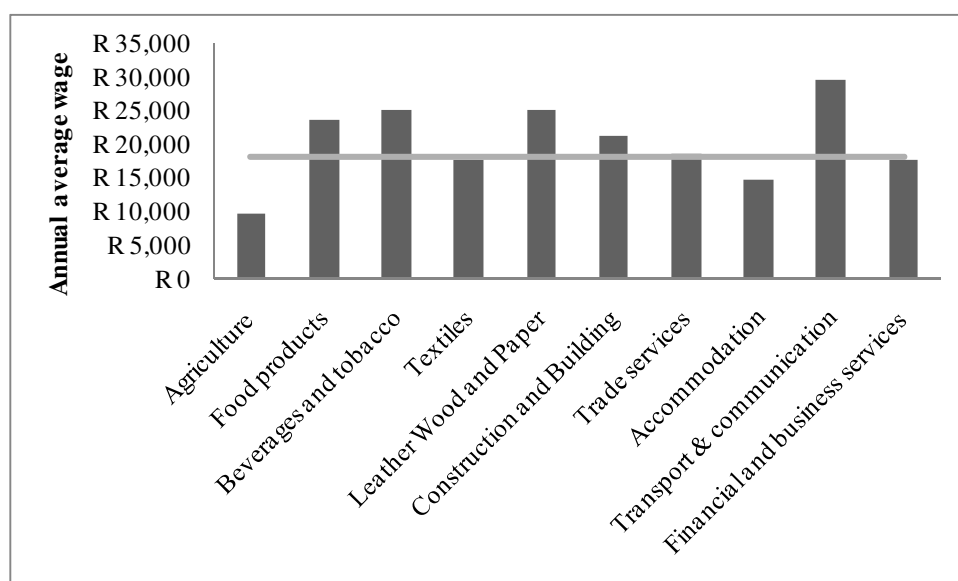
Appendix Table 9: Wage Subsidy Scheme Effectiveness: Cost per Job Created

		$\eta = 0.3$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 1.0$	$\eta = 2.0$
Short run	Tax capital stock	R 41,460	R 26,316	R 19,652	R 14,595	R 8,618
	Tax personal income	R 43,063	R 27,128	R 20,188	R 14,948	R 8,767
Long run	Tax capital stock	R 33,638	R 24,115	R 19,065	R 14,753	R 8,930
	Tax personal income	R 31,977	R 23,030	R 18,246	R 14,149	R 8,591

Source: CGE/micro model results

¹⁰⁸ Upon registration 100 per cent of an unemployed learner's annual wage can be claimed (up to a maximum of R30 000) and 70 per cent of an employed learner's annual wage (up to a maximum of R20 000). Upon completion (i.e. a qualification is obtained) 100 per cent of the annual wage (capped at R30 000) can be claimed for all learners. Typically learnerships run for between 2 and 3 years; this means that between 50 and 100 per cent of the wage is subsidised if prescribed learner allowances are paid. In terms of the sectoral determination governing minimum wages/allowance for learners (see www.labour.gov.za), a minimum annual allowance of between R6 240 and R36 400 has to be paid to learners, depending on the qualification level targeted by the learnership agreement.

Appendix Figure 3: Annual Average Sector-Specific Wages of Targeted Workers



Note: The horizontal line represents the national average annual wage of targeted workers across all sectors (approximately R18 000).

Source: South African PROVIDE SAM (2000) and author's own calculations.

Appendix Table 10: Baseline FGT Poverty Estimates and Confidence Intervals (Disposable Per Capita Income)

Annual poverty line	P_0			P_1			P_2		
	Estimate	95% conf. int.		Estimate	95% conf. int.		Estimate	95% conf. int.	
		Lwr.	Upp.		Lwr.	Upp.		Lwr.	Upp.
R 1,000	0.095	0.089	0.101	0.028	0.026	0.031	0.013	0.011	0.014
R 1,250	0.147	0.139	0.154	0.047	0.044	0.050	0.022	0.020	0.023
R 1,500	0.200	0.191	0.208	0.068	0.064	0.071	0.033	0.030	0.035
R 1,750	0.249	0.240	0.258	0.090	0.086	0.094	0.045	0.042	0.047
R 2,000	0.291	0.281	0.300	0.113	0.108	0.117	0.058	0.055	0.061
R 2,250	0.330	0.320	0.340	0.135	0.130	0.140	0.072	0.069	0.075
R 2,500	0.367	0.357	0.377	0.156	0.151	0.161	0.086	0.082	0.090
R 2,750	0.403	0.392	0.413	0.177	0.171	0.182	0.100	0.096	0.104
R 3,000	0.432	0.421	0.442	0.197	0.191	0.203	0.114	0.110	0.118
R 3,250	0.461	0.451	0.472	0.216	0.210	0.222	0.128	0.123	0.132
R 3,500	0.485	0.474	0.496	0.234	0.228	0.241	0.141	0.136	0.146
R 3,750	0.506	0.495	0.517	0.252	0.245	0.258	0.154	0.149	0.159
R 4,000	0.527	0.516	0.538	0.268	0.262	0.275	0.167	0.162	0.172

Source: IES/LFS 2000 and author's own calculations

4.2.3. National Treasury Wage Subsidy Study: Comparing Methods and Results

Go et al. (2009) argue that the structural feature of the South African labour market is manifested in the complementarity (or lack of substitution) between skilled and low-skilled workers. The production structure in the CGE model employed by Go et al. (2009) uses a translog function as opposed to the more common CES function used in this study. In their simulations Go et al. (2009) then consider the impact of wage subsidies for different

reference elasticities (low, medium and high) in much the same way we consider outcomes under various weighted average elasticity levels. The important difference, though, is that the relative substitutability between low-skilled and skilled workers in their model is lower than that of other factors of production. This contributes to the fact that their simulations yield lower employment effects than those generated in this study, controlling for targeting and the actual wage shock implemented. Of course, for a proper comparison it would be necessary to review in detail how consumer demand in their model responds to changes in prices and household incomes and compare that to the chosen elasticities for our model. As in this study, Go et al. (2009) did not consider the sensitivity of results to different price and income elasticities.

As far as the wage subsidy scenario modelled in Go et al. (2009) is concerned, they model a 10 per cent constant wage subsidy payable for all low- and medium-skilled formal sector workers. They exclude the mining, petroleum and government sectors. Although their report is not explicit about this, it appears as if the targeting mechanism assumed yields a slightly smaller target group than that in our model.

Further important differences include the following: firstly, our CGE model does not distinguish between formal and informal sector workers. Go et al.'s (2009) estimates suggest that up to one-quarter of workers in South Africa are in fact employed in the informal sector. Secondly, although we exclude more sectors from the target group, our average subsidy value is higher at about 12.5 per cent per worker (see Table 6.1). Overall, therefore the programme modelled in our study is slightly larger. This partly explains why our modelling approach yields larger employment results (see below), but even in their high elasticity scenario their total programme cost is R21.9 billion (2003 prices), which is lower in real terms than our benchmark cost estimate of R20.8 billion (2000 prices). Given the smaller employment effects generated, the subsidy cost per job created is also significantly higher in the Go et al. (2009) study.

The employment results generated in two studies are comparable in our low-elasticity ($\eta = 0.3$) and in Go et al.'s (2009) medium elasticity case (about 4 per cent increase in overall employment in the economy). In our benchmark simulation employment growth exceeds one million jobs, representing a 9.5 per cent increase in total employment (see Table 6.4). It is therefore also not surprising that our model predicts much larger income gains for poor households; for example, those in the poorest decile experience a 42 per cent increase in income (benchmark simulation in the youth-targeted micro-simulation model, see Figure 6.3) compared to Go et al.'s (2009) estimate of 20 per cent. The way in which jobs are allocated to individuals may also explain some of the differences. We specifically target the youth whereas Go et al. (2009) include a variable called 'previous sector of employment' in their

employment probability model, which is likely to exclude many young labour market entrants who have never worked before.

Ultimately, Go et al. (2009) derive a similar conclusion to that in this study, namely that the assumption around elasticities of substitution or complementarities between different groups of factors are important in determining the overall employment and poverty effects. Their study concentrates on issues around skills shortages and how complementary policies (such as a relaxation of immigration controls on skilled workers) may enhance the impact of a wage subsidy given these complementarities. In fact, one of their main findings is that labour market flexibility is the critical issue here. Areas for future research highlighted in their conclusions include imperfect competition and how high mark-ups and concentration ratios in the economy are affecting labour market outcomes, as well as dynamic effects of schooling and training. Our study, in turn, focused more on financing issues and the sensitivity of results to different ways of modelling the micro-level poverty and distributional effects.
